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The AUTOMOBILE

New England— Will Spend $58,500,000 for Cars and Accessories

$21,000,000 for Tires and Accessories in 1915— Industries in the Six States Total $2,950,000,000

By J. Edward Schipper

BOSTON, MASS., March 6—In the New England territory there is $58,500,000 worth of business awaiting the automobile and accessory trade. Last year through this territory, which has its logical capital at Boston and whose boundaries are the boundaries of the six New England states save that small portion of Connecticut south of Bridgeport, the business amounted to $49,000,000. From a carefully-compiled census taken at the Boston show the amount of business in complete passenger vehicles totaled $30,900,000. If the percentage of increase throughout the year continues at the same rate as it has up to this date, the passenger vehicles sold in the New England territory during the coming year will go well above the $37,000,000 mark.

Big Tire Business

This enormous car business will carry along with it at least $17,000,000 worth of tire business and in addition to this the big accessory houses whose business covers the territory of New England are figuring on a total volume of business that will closely approximate the $4,500,000 figure. This does not even touch the vast industries furnishing parts and fittings such as nuts, bolts, screws, hub caps, etc.

These figures, even when taken roundly, are sufficient to cause the casual observer to wonder where all this money can come from. The cars bought throughout New England are largely used for purposes of recreation and hence to a great percentage are bought with funds that may be considered as surplus and above the ordinary money used in carrying on a business. The principal industry, throughout the major portion of the six states, is manufacturing. On the other hand, vast areas of ground in each of the states are devoted to farming and some of the richest crops in the world come from this country of the machine shop, mill and foundry.

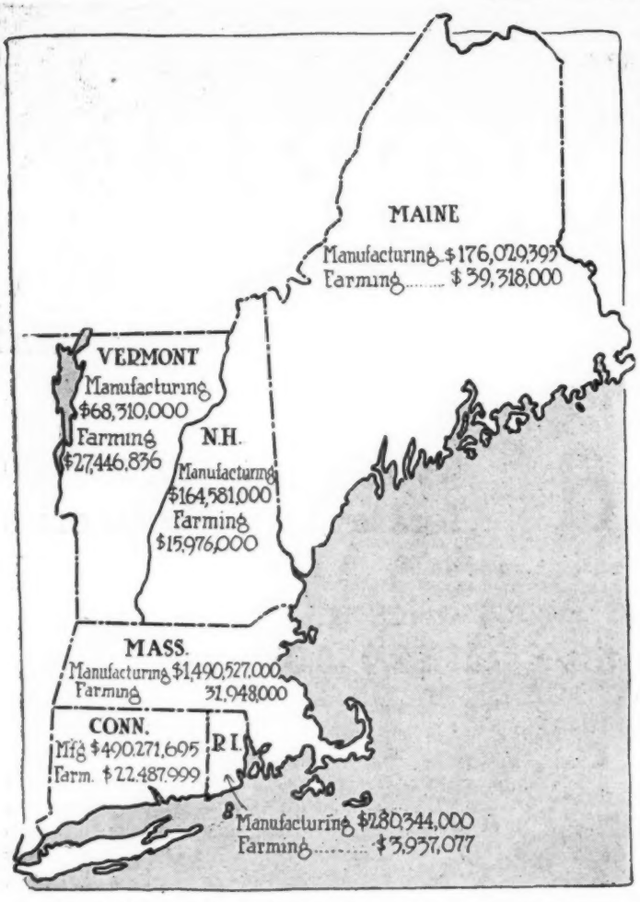
Comparison between automobile and accessory business in New England in 1914 and estimate for 1915. Last year a total of $49,000,000 was spent for cars and accessories; $58,500,000 is the estimate for 1915

Products Worth Billions

Based on the census of 1910, and with due consideration to the normal increase and decrease in business throughout the past 5 years, the manufacturing industries in the six New England states turned out products to the value of $2,950,000,000 during the year 1914. That this figure will be closely equalled, if not surpassed in 1915, is practically a certainty, according to authorities in Boston.

While some of the industries are not as busily engaged as a year ago, the general tone is one of great prosperity. The New England factories are getting the benefit to a large extent of the war in Europe. The wool factories, the cotton mills, the boot and shoe plants, are working night and day to make up for the enormous wasteage of material now going on throughout the countries at war.

Besides these industries throughout these states there are many factories engaged in the manufacture of arms and ammunition. These are located



Map of New England, showing the value of farm and manufactured products of each state as reported in the census of 1910. It is interesting to note the high value of manufacturing as compared to farm products.

in Massachusetts and Connecticut and, needless to say, the demands upon these are larger than ever before. Some of these factories are building great additions and taking on hundreds of laborers in addition to their normal amount of help during peace time.

The value of the farm land scattered throughout the states in the New England group is enormous and this is paying excellent returns. This is especially true in the field of the cereal and dairy products. Taking a total of the value of crops during the past years the estimate can be conservatively made that for 1915 the total figure will closely approximate $150,000,000 even at the normal prices that held in 1914. But with the increase due to the rise on price in many of the farm products the final returns will probably show a higher result. The principal crops are corn, oats, wheat, barley, buckwheat, hay and forage. In addition to these the potato industry of many of these states, such as Maine, Massachusetts and Rhode Island is a vast factor in the buying power.

Foundries and Machine Shops Important

While all of Connecticut may not properly be considered in New England territory there is only a small portion that falls outside. In this state alone the manufacturing industries turn out annually more than $500,000,000 of finished products. The factories engaged in the foundry and machine shop work alone employ approximately 50,000 people and the value of the products reaches close to $70,000,000. These companies are running full blast and a large part of the buying power in the state is centered in this industry.

Brass and bronze work, while furnishing employment to only half the number of people as the foundry and machine shop, results in a product valued at the same amount due to the higher cost of the raw material. The profits in this business are also large factors in the purchasing of automobiles in Connecticut. Besides these two leading industries, the manufacture of wool, silk and firearms are of great importance. The firearm industry in Connecticut during the year 1910 turned out finished products valued at $20,000,000. In 1915 it is estimated that the figure will be close to $60,000,000.

Farming in Connecticut is carried on over an area that embraces practically two-thirds the acreage of the state. The total value of the farm land is $160,000,000 and the total value of the crops is about $24,000,000 annually with prospects bright at present prices to surpass this amount.

Maine Potato Crop Buys Cars

Maine, although one of the great farming states in the group, has manufactures which annually quadruple the value of the farm products. The manufactured products from Maine during the year 1915 will be worth $176,000,000. The value of the farm products will be more than $40,000,000. Yet one dealer states that a good potato crop in the county of Aroostook means thirty-five sales. He sells a $1,000 car. In one county a good potato crop will mean $35,000 worth of cars alone for one dealer. Add to this the tire business and the accessory business that will naturally follow during the year and then consider that this is only one county of the state and only one of the many industries.

The principal manufacturing enterprises of Maine are lumber, paper, cotton, shoes and wool. Every one of these industries are prosperous and many, in fact, better than they have been for years. A dealer selling cars priced at $1,295 states that during the past month he has sold three cars to brokers in wool who have made more money in the last 3 months through bonuses alone than they had in any two years previous. These were salaried men working with profit-sharing bonus agreements.

There are over 60,000 farms in Maine and their total value is over $200,000,000. The principal crops are the cereals—corn, oats, wheat and buckwheat. Potatoes follow closely behind these and the potato farmer, as indicated above, is often a good buyer.

Massachusetts the Leader

Massachusetts is the leading New England state in the value of its industries. Within a 20-mile circuit about Boston is one of the biggest car buying centers in the world. The concentration of the population may be conceived from the fact that 93 per cent. of the population of the state dwell in cities. There are twelve cities in Massachusetts having a population of 50,000 or more. In addition to these there are forty-three between 10,000 and 50,000. In spite of this, Massachusetts is the fifth smallest state in the Union.

The combined manufacturing industries of Massachusetts produce more than $1,500,000,000 worth of goods in a year. Of this gigantic total the boot and shoe industry is the largest factor, the value of its products being $250,000,000 a year. The beneficial effects of the war on this industry have, therefore, served to increase the biggest buying power of the state. Since the opening of hostilities foreign agents have bought up all the available supplies of shoes for the foreign armies, thus giving employment to hundreds of people and forcing the shoe-producing machinery to work to its utmost capacity. The other big industries of Massachusetts are also those which have been benefited by the foreign war. They are the manufacturing of cotton, wool, foundry and machine products and the printing and publishing business. In addition to these there are the meat slaughtering and packing industries, the liquor industry and many others of considerable proportions.

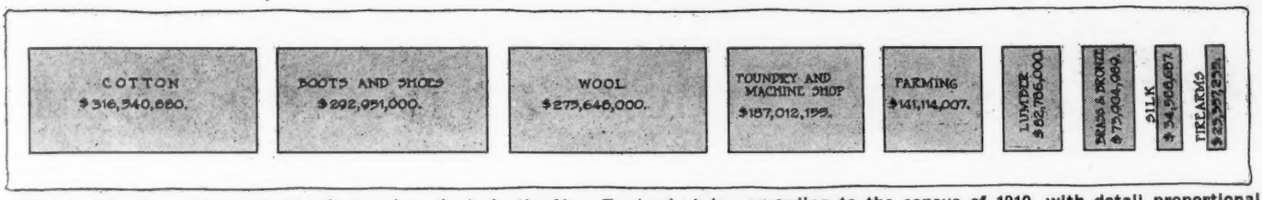


Diagram of value of leading manufactured products in the New England states according to the census of 1910, with detail proportional charts for farming and the various industrial businesses

Car dealers throughout New England have already begun to feel the beneficial effects of the foreign purchases of shoes and wool. These two industries have made New England optimistic and there is a spirit of happy prophecy in the atmosphere of the Boston show.

In spite of the enormous concentration of the population, nearly three-fifths of Massachusetts, insofar as area is concerned, is devoted to farming. There are nearly 2,000,000 acres of improved farm land in the state. This is nearly two-thirds of all the farm land—a remarkable proportion when compared to other states where practically only one-third is improved. The value of the crops anticipated for the 1915 season will run in excess of $35,000,000. The most important farm products are corn, oats, rye, hay and forage, potatoes and tobacco.

In the city of Boston itself are located the commission houses which put this vast market in connection with the channels of trade. The tonnage of the shipments from Boston is second only to that from New York and the internal business created by the enormous population of Greater Boston itself forms a huge potential buying power which an era of prosperity quickly puts into actual touch with the automobile trade. The roads surrounding Boston, and, in fact, throughout all of New England, are good. The population as a whole is interested in good roads and it is impossible to fortell the extent of the actual business if the re-awakening prosperity and the discontinuance of closed mills takes place.

New Hampshire, while largely devoted to farm lands, is still a manufacturing state. The value of its manufactured products as compared with the farm products, is $175,000,000 for the former and $114,000,000 for the latter. The principal industry, as in Massachusetts, is the manufacture of boots and shoes and the prosperous condition of this trade, as reported for Massachusetts, is also true of this state. The value of this industry in New Hampshire is $40,000,000. In order of importance the industries of New Hampshire are the same as in Massachusetts, cotton being second with the valuation of $35,000,000 worth of products a year; wool next, with $17,000,000; then lumber, with $16,000,000; paper and wood pulp, $15,000,000; and foundry and machine shop products, $5,000,000.

27,000 New Hampshire Farms

The New Hampshire farmer is a good car buyer. In the state there are 27,000 farms of all descriptions having a total value of $105,000,000. The big crops, unlike most other New England states, are not the cereals, one-half of the land being devoted to hay and forage. Outside of these the truck farms play an important part.

Rhode Island, the smallest state in the Union, having but 1,250 square miles of territory of which 197 are water surface, has but two cities of over 50,000. These are Providence and Pawtucket. In addition to these there are seven having between 10,000 and 50,000.

Rhode Island is a manufacturing state, the value of its manufacturers compared with its farm products is, respectively, $290,000,000 and $4,000,000. Worsted and wool products valued to the extent of $75,000,000 are manufactured yearly. Cotton follows second with $51,000,000 and next jewelry, $25,000,000. The jewelry trade gives employment to 10,000 people, this being the only New England state in which jewelry manufacturing is of sufficiently large proportion to bring it into the leading industries. Foundry and machine shop products are made to about the same valuation as the jewelry.

$4,000,000 Crops in Rhode Island

While farming in Rhode Island is not of the prominence in proportion to the rest of the industries that it has in the other New England states, still the money-making capacity of Rhode Island farmers is proverbial. The average farm is not extensive and there are a little more than 5,000 farms in the state, most of which are very small, yet the $4,000,000 worth of farm products are produced annually on a total acreage of 178,344. The principal crops are corn, oats, rye, barley, hay and potatoes.

Vermont's biggest industry is in the quarrying of marble and other kinds of stone. Out of a total of $69,000,000 worth of manufactured goods, stone products have a value of $13,000,000. Lumber is next, with $9,000,000, and dairy products just slightly under that figure. The wool industry is also quite important in Vermont, producing over $5,000,000 of business in a year.

Dairy Products a Factor

In Vermont there are 32,709 farms; the total acreage of the state is 5,839,360, of which 4,700,000 is in farm lands, 2,000,000 acres being improved. The value of the annual crops is $28,000,000. Dairy products, which are classed as under the manufactured industries, still occupy the attention and require considerable space of the farmer and his land. There are only three cities in Vermont which have over 10,000 population; these are Burlington, Rutland and Barre.

These are only the big producing industries in each state. In addition the non-producers bring the total up to a bewildering summation that can hardly be estimated.

Value of Products of New England States from 1910 Census

INDUSTRY	CONNECTICUT	MAINE	MASSACHUSETTS	NEW HAMPSHIRE	RHODE ISLAND	VERMONT	TOTAL
All Mfg.	$490,271,695	$176,029,393	$1,490,529,000	$164,581,000	$280,344,000	$68,310,000	$2,670,065,088
Farming	22,487,999	39,318,000	31,948,095	15,976,000	3,937,077	27,446,836	141,114,007
Boots and Shoes	1,658,000	15,509,000	236,344,000	39,440,000	None	None	292,951,000
Cotton	24,231,880	21,932,000	186,462,000	33,602,000	50,313,000	None	316,540,880
Wool	19,363,000	18,490,000	141,967,000	16,731,000	74,600,000	4,497,000	275,648,000
Fdry. and Mach. Shop	65,535,155	5,237,000	86,926,000	4,947,000	20,612,000	3,755,000	187,012,155
Brass and Bronze	66,932,969	None	6,042,000	102,000	828,000	None	73,904,969
Silk	21,062,687	None	8,942,000	None	4,584,000	None	34,588,687
Firearms	19,949,235	None	3,408,000	None	None	None	23,357,235
Lumber	7,846,000	26,125,000	23,026,000	15,284,000	1,907,000	8,598,000	82,786,000

329 Cars and Trucks at Boston Show

General view of Grand Hall with the stage in the background and Grecian Temple in the foreground

87 Commercial Vehicles on Display—2,000 Dealers Expected To Visit Show During the Week—Many Chassis

BOSTON, MASS., March 6—Once more the Boston dealers' show, which opened here yesterday, has shown that in some respects even the great National exhibitions of New York and Chicago must yield their premier position to the great New England business gathering. Four hundred and thirty-three names are in the list of exhibitors. Of these 107 are showing cars and the remainder accessories, publications, etc. There are 329 cars on the floor. New York had 208 and Chicago 242. Of the 107 car exhibits, sixty-six are displays of gasoline passenger cars, thirty-six are commercials, four electric passenger vehicles and one steam. Altogether there are 234 gasoline passenger cars, seven electrics, eighty-seven trucks and one steam car.

As in the past the electric side of the exhibit does not show up as strongly as at New York and Chicago, the only representatives here being Detroit, Milburn, Rauch & Lang and Waverley, but of the utmost significance is the great commercial vehicle exhibit which fills the major part of the basement space. Here the area which last year was largely devoted to motorcycles, machinery and accessories is now almost completely filled by the varied exhibits of the truck companies.

While at Chicago and New York the truck companies were forced to confine their efforts merely to desk room, here the dealers of great industrial New England have backed their belief in the value of a commercial vehicle exhibit to the extent of purchasing space in which to display their line of business vehicles. The truck exhibitors who hold forth in Mechanics' Hall basement are not confined to one class of trucks but vary all the way from the little delivery car mounted on the Trumbull small car chassis up to the big 10-ton Knox tractor announced last week. The list of those showing commercial vehicles follows:

Andover	Jeffery	Pierce Arrow
Atterbury	Kelly	Republic
Autocar	Kissel	Reo
Buick	Knox	Robinson
Chase	Koehler	Rowe
Federal	Lippard-Stewart	Service
Ford	Locomobile	Stewart
Garford	Mais	Studebaker
G. V.	Netco	Trumbull
Howard	Overland	Vim
I. H. C.	Packard	White

As in the other shows throughout the country the cyclecar has disappeared and in its place the small four has appeared. Last year there were eight cyclecar exhibitors and of these only one name appears this year. This is the Trumbull which has now entered the small car and light delivery car class although still maintaining the narrow tread

of which it is the only example at the exhibition.

The feature of the exhibit is the individuality shown in the color schemes. The polished black that has prevailed up to this year has given away to less somber hues. On all sides there are various grays, blues, reds and greens, with which are mingled other colors which, although more quiet, are still a departure from the stereotyped black of 1912, 1913 and 1914. There is a great tendency towards striping the upper edge of the body and also a noticeable inclination to paint the hood in some dark, serviceable color that will be little harmed by the heat of the motor and to paint the main body and running gear a different, and usually brighter, hue.

Census of the Boston Show

Number of Exhibitors	433
Car Exhibitors	66
Truck Exhibitors	36
Electric Exhibitors	4
Steam Car Exhibitors	1
Number of Cars	329
Gasoline Passenger	234
Trucks	87
Electrics	7
Steam Passenger Cars	1

The use of the stripped chassis is increasing at the Boston show as well as throughout the circuit. In spite of the claim made by the average salesman that the car buyer is more interested in the upholstery than in the mechanism, the mere fact that the exhibitors feel it necessary to go to the expense of finishing a chassis particularly for exhibition purposes is sufficient indication of the class of inquiries that are made at the exhibition. There are thirty-nine stripped chassis on the floor this year as compared with twenty-seven a year ago. Two companies, Reo and Chalmers, are each showing two of these and the interested groups surrounding them and listening to the lectures upon their merits show that these chassis are amply accomplishing their purpose.

In addition to the stripped chassis there are cut-away motors shown by Paige, Marmon and Chevrolet. These also are always found to be surrounded by groups of interested spectators. They arouse interest and pay an implied compliment to those who are interested in following the development in the automobile industry.

Primarily, it is a great retail show. The manufacturer is only indirectly interested, the basis of the whole exhibit being the New England distributor.

The show is not sanctioned by the Motor and Accessory organization, but in spite of this the accessory exhibit is highly creditable and is in advance of what it was a year ago. A year ago the Motor and Accessory organization took a vote as to the advisability of taking space at the Boston show and the opposition won 263 to fifteen. As a result the accessory exhibit last year was rather meager. This year it has become stronger and the accessory exhibitors are very optimistic as regards the actual business accomplished during the show.

The big factor of the show is the New England car distributor. This offers him the opportunity of bringing together his subdealers who are scattered throughout the six New England states and of holding dealers' conferences and showing the new models which in many cases have not been seen by the sub-distributors until this time.

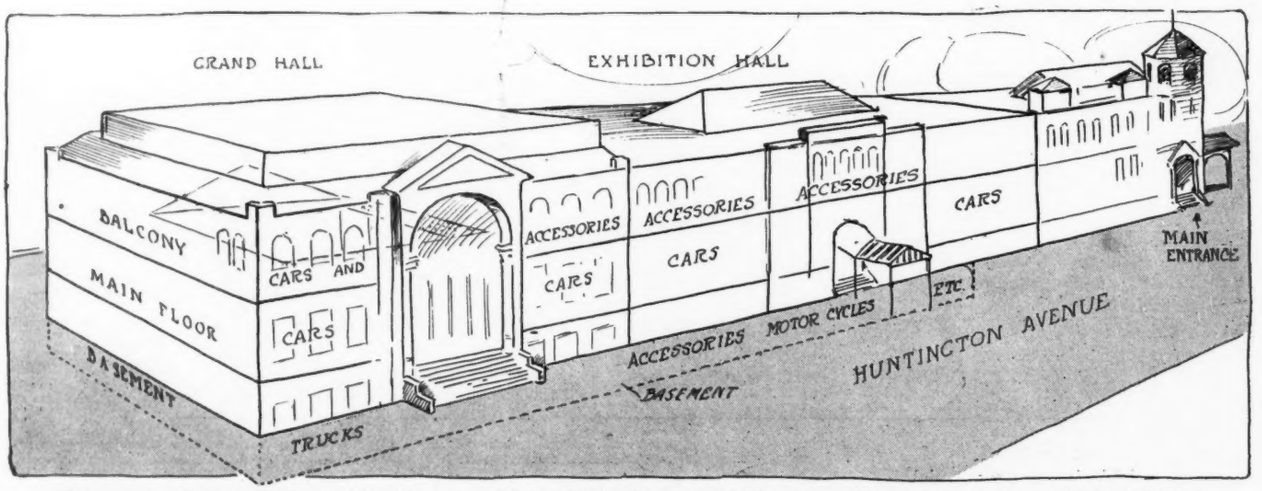
The show is hardly under way and there is as yet no index to the total amount of business that will be done at the show. Over 2,000 dealers are expected to call before the exhibit is over and of these 1,700 are subdealers to those who have their main headquarters in Boston. In addition to these there is sure to be a large number of which no record can be kept because, while the make of car that they represent will not be exhibited at the show, they are anxious to call around to see what the other fellow is doing. There is no way of keeping a record of these because all do not register and the courtesies of season tickets are not offered those who do not represent cars that have taken space.

Show Opens Early

Instead of opening at 8 p. m., the public was admitted at 2 p. m. this year. This was a wise move because, instead of the usual opening rush with the resulting congestion and confusion, the crowd arrived gradually and, while the attendance figures cannot as yet even be estimated, if the opening day is any indication there will be a record number established.

Two foreign cars are at the show. These are the Renault and the Rolls Royce. On these are mounted examples of high-priced body work which attracted general admiration from the show visitors. The Rolls Royce exhibited by the Schuette company has also a stand at the Copley Plaza Hotel.

The individual exhibits are noticeably attractive at this show. Many new bodies are scattered about and while a number of makers are showing the cars that have been shipped from show to show throughout the country others have new jobs that are for the first time on exhibition. There are five eights, Cadillac, Abbott, King, Cole and Detroiter. War has left its imprint on the Packard exhibit which is mounted on the stage of exhibition hall. Here there is an armored car with a turret mounted in Yankee cheese box style on a 2-38 chassis. The chassis itself would be unrecognizable, however, as it is entirely boxed in by an armor plating of 3-16-inch chrome-nickel steel. The radiator is covered by a door that can be closed by the driver who sits



Perspective sketch of Mechanics' Building, in which the Boston Show was held, with positions of the various exhibits indicated

Left—Grand Hall, showing the typical layout of the exhibits. This is looking out from the Grecian Temple towards the stage upon which there is a Grecian view shown through the façade of a Greek Temple. The signs for the various exhibits are in glass on white marble pillars

Below—Looking down the center aisle of Grand Hall beneath the shelter of the Greek Temple. This also discloses a part of the Grecian scene on the stage

Bodies Feature of Truck Exhibits

IN the basement are the commercial models of thirty-six manufacturers, three of which are new, the Andover electric, the 1,500-pound Ford and the Howard. All told, eighty-seven commercial vehicles are shown, monopolizing the basement floor except for a few passenger cars which could not find room on the main floor, and a few motorcycle and accessory exhibits.

New things at the show are the three new trucks mentioned, the new Knox, the new worm-driven Packards, the new worm-driven Locomobile, the 3 5-ton Federal and the Netco, all exhibited for the first time, and the Ford delivery car, which after 2 years out of the commercial branch of its business, has returned to the delivery car market.

Bodies are the feature of the truck exhibits as always, although a number of the exhibitors showed chassis, indicating that truck buyers are interested in construction.

The new Andover electric is a radical departure from previous design in that its cab has been set well forward and very low between the front wheels, with the entrance through

within the housing. In the turret is mounted a quick-firer which is controlled by a man who sits within the turret on a saddle similar to that used on a bicycle. The tires, although similar to pneumatics in appearance and mounted on demountable wire wheels, are solid.

On the same stage is the Cadillac eight-cylinder stripped chassis. As at all other shows on the circuit this year it is a great center of attraction and there is always a crowd to listen to the orator who lectures upon the merits of even torque and few gear changes attendant upon driving an eight.

Stanley is showing the new steam car and to those who are familiar with the round-decked ferry-boat type of Stanley the new job will be a revelation. Unless the hood were lifted the fact that it is a steam car would never be disclosed. The body is a modified streamline fore-door flush-sided job with a cowl dash, the hood is similar to that found on any gasoline car and the rounded nose has been supplanted by a radiator which it has been found possible to employ by the use of a special lubricant containing graphite and kerosene eliminating the deposit of scale on the radiator.

Herff-Brooks has another car which is exhibited at the Boston Show for the first time. This is the new model sell-

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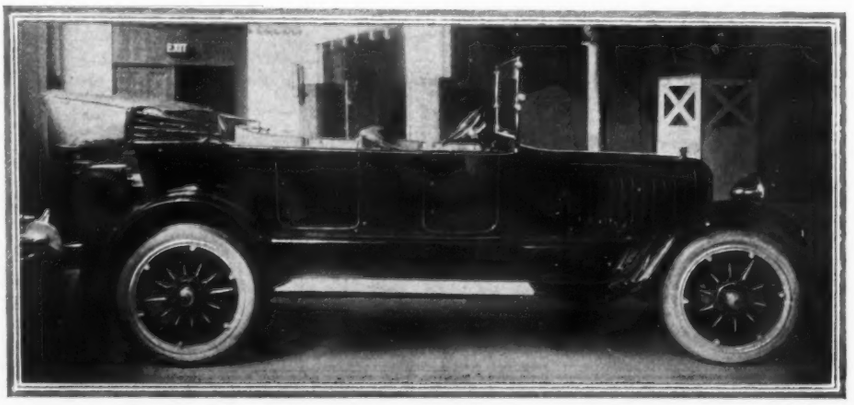

View of the new Stanley steamer which is changed in appearance due to the adoption of a V radiator and other alterations in design

New Knox tractor which is exhibited for the first time at the Boston show

a front door. It is worm-driven on the rear axle, and its battery is suspended close under the necked-in frame, and the trays are in swinging arms. The new Howard machine is a standard design of 1,500-pounder with bevel drive.

Atterbury shows its new worm-driven chassis, the new feature of which for 1915 is a cast-case radiator on the larger sizes. The Autocar is shown in a number of chassis with different styles of bodies and one stripped chassis. The most interesting of the bodies is an ambulance intended for Red Cross service. This body is set low on the chassis, the rear wheels being inclosed in wheel housings. It has screened sides and roller curtains, and carries six stretchers. When not in use, the stretchers are arranged to be carried on hooks at the side, crosswise seats accommodating eight passengers sitting inside.

The center of interest at the Jeffery booth is the four-wheel-drive chassis, the standard models being also exhibited. Knox tractors are shown in connection with two novel types of trailers, one of which is unusually long, being a crushed stone wagon, with two hoppers which may be dumped at the bottom separately. The other is a shorter type, arranged to dump at the rear, the elevating gear being carried at the front, and acting by means of worm gears actuating chains and sprockets. It is equipped with steel wheels of the type employed on traction engines.

The feature of the Packard exhibit is the new worm-driven chassis, the 1-tonner being exhibited for the first time. This vehicle is the smallest truck yet put out by this Detroit maker, and while it is identical in lay-out and general specifications with the larger worm-driven Packards, it is much smaller.

On a 2-ton Reo chassis is shown a simple type of dumping body, actuated by toggle levers, the feature of which is great lifting leverage at the start of the lift, with a quicker movement as the body is raised and more of its weight overbalances the rear pivot. A bus body, with seats that fold up, leaving a clear loading space for baggage or freight is the feature of the Studebaker commercial vehicle line.

At the White exhibit, the largest among the trucks, three novel bodies are shown. The most interesting from the standpoint of current interest is a luxurious bus, mounted on a 1.5-ton chassis. This bus is unlike others of its kind in that it bears no exterior resemblance to a street car, as most bus bodies do, but is constructed more on the order of a limousine. It is of unusual width, with flush sides and drop-sash windows. The interior is upholstered in black leather with cork carpet on the floor. The eaves are somewhat lower than usual, giving the body rakish lines, headroom within being obtained by means of a trunk skylight which merges into the roof at front and back, so as not to be visible from the front or rear.

Entrance and exit has been provided by a door at the front on the right side, the door being of the sliding type and interconnected with a folding step, operated by a lever at the driver's right. The driver's seat is to the left, the bus being arranged for one-man operation.

Another interesting White creation is a special body for the Clearing House Parcel Delivery Co., of Boston. This concern operates a co-operative delivery business and has over 100 vehicles, it is understood. The body is arranged especially for the handling of a large number of packages of

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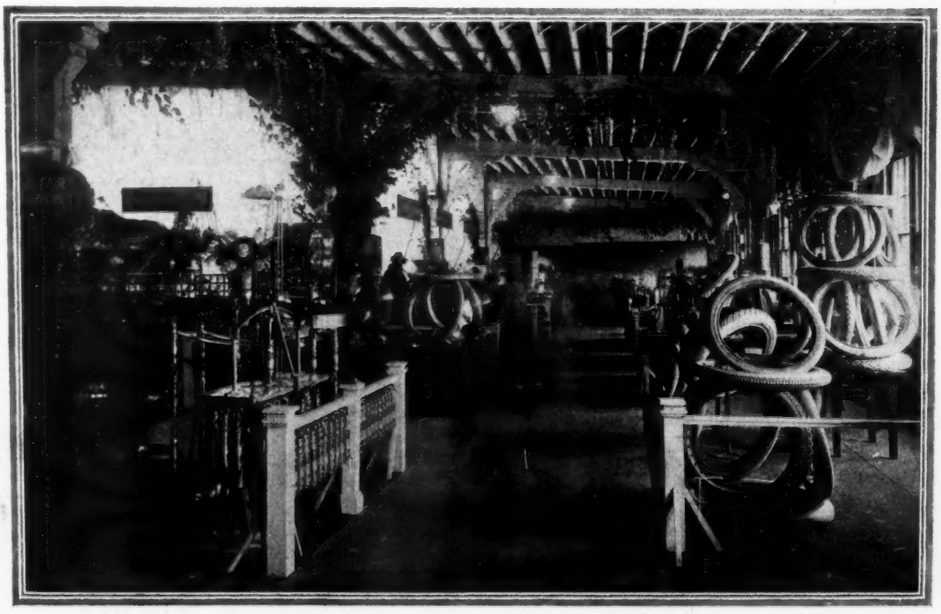
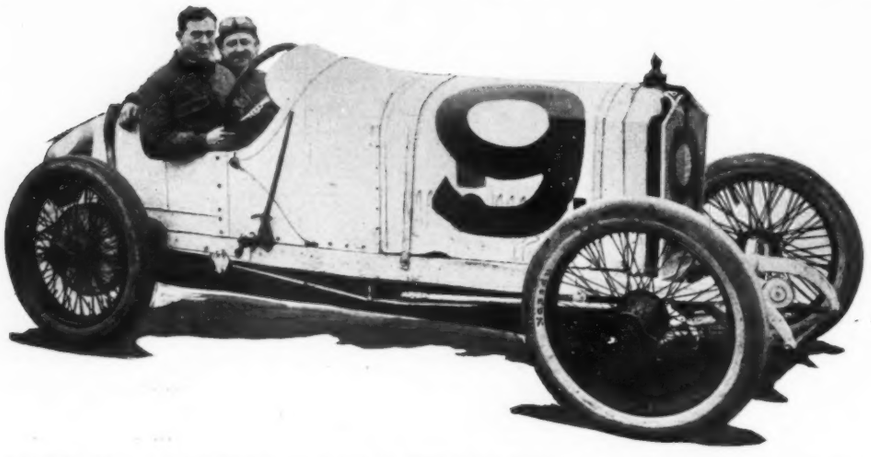


Accessory department, which includes a large number of up-to-date exhibits

Resta Wins Again—Takes Vanderbilt



Dario Resta in the Peugeot with which he won the Vanderbilt Cup last Saturday. The week before he won the Grand Prize race in the same car

Peugeot Covers 296-Mile Course at 67.5 M.P.H — Wilcox, in Stutz, Again Second— Pullen's Mercer Third

SAN FRANCISCO, CAL., March 6—*Special Telegram*—Handling his Peugeot with all the dash and skill which characterized his Grand Prize victory, Dario Resta today shot across the finish line as winner of the Vanderbilt Cup. Behind him roared the pursuit of the fastest cars and most daring drivers in America, but despite the dangerous and spectacularly treacherous character of the course, the plucky English-Italian led the field with his French car for three-quarters of the race. His average for the 300.3 miles, comprising seventy-seven laps of the 3.8489-mile course, was 67.3 miles per hour, a terrific pace when the condition of the track is considered.

Wilcox Again Second

And the most remarkable thing of the race was that Wilcox, whose Stutz finished second last Saturday in the Grand Prize, was again second in today's contest with an average speed of 65.6 miles per hour. Thus both first and second went to the same men who won these positions in the Grand Prize.

Those who thought that Resta won because of a fluke and the withdrawal of many of the best drivers in the Grand Prize are silent. Nothing but praise is now heard for the unassuming little driver who has captured in his first races on American soil, the most coveted trophies of the automobile racing game.

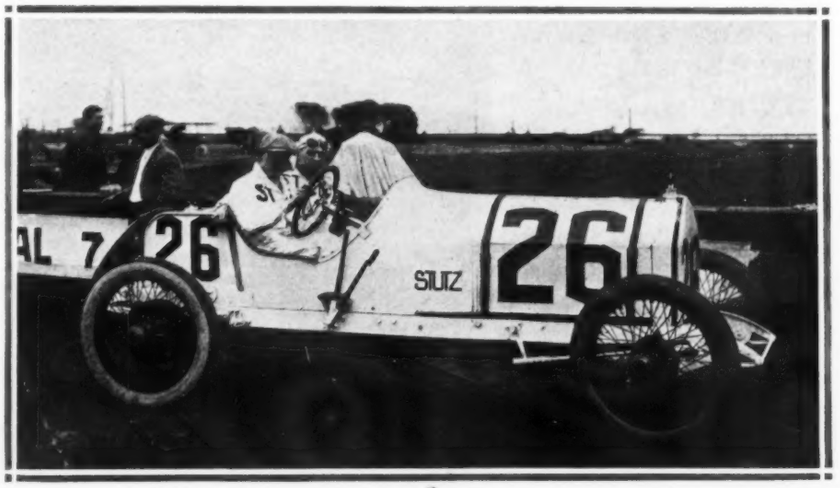
Pullen Is Third

Pullen, the world's speed record holder, won third place in the Mercer, after having furnished for the spectators the greatest thrills of the day. He and Resta drove side by side down the planks in front of the grandstand time after time. The crowds yelled their approval, both having their supporters, but none of the cheering thousands realized that Pullen, though he was racing, was a full lap behind. His average speed was 65.3 miles per hour.

DePalma, twice winner of the Van-

Tabular Story of the Vanderbilt

Car	Driver	Time	Average	Prize
Peugeot	Resta	4:27:37	67.3	$3,000
Stutz	Wilcox	4:34:36	65.6	2,000
Mercer	Pullen	4:35:37	65.3	1,500
Mercedes	DePalma	4:39:07	64.5	1,000
Maxwell	Carlson	4:44:12	63.3	500
Delage	Newhouse	4:45:38	63.0	
Maxwell	Oldfield	4:52:47	61.5	
Simplex	Disbrow	4:53:37	61.3	
Ono	Young	Flagged lap 77		
King	Klein	Flagged lap 76		
Case	Hearne	Flagged lap 76		
Overland	McKelvy	Flagged lap 75		
Stutz	Anderson	Flagged lap 73		
Edwards Sp	Gandy	Flagged lap 69		
Mercer	Ruckstall	Out lap 72, broken axle		
Deusenberg	O'Donnell	Out lap 54, wrecked		
Stutz	Grant	Out lap 51, water in gas tank		
Tomasini	Tomasini	Out lap 43, burned out bearing		
Case	Burman	Out lap 43, wrecked		
Tahis	Cable	Out lap 43, cracked cylinder		
Gordon Sp	Gordon	Out ... engine trouble		
Deusenberg	Alley	Out lap 37, wrecked		
Edwards Sp	Kennedy	Out lap 30, broken wheel		
Californian	Bragg	Out lap 24, broken camshaft		
Parsons Sp	Parsons	Out ... engine trouble		
Bugatti	Marquis	Out lap 15, broken spring		
Francis Sp	Francis	Out ... engine trouble		
Chevrolet	Durant	Out lap 7, stripped gear		
Chevrolet	Lecain	Out lap 7, broken piston		
Maxwell	Rickenbacher	Out lap 7, engine trouble		
Mercer	Nikrent	Out lap 4, engine trouble		



Howard Wilcox in the Stutz which was second in both Vanderbilt and Grand Prize races at the Panama-Pacific Exposition

derbilt Cup, finished fourth, driving a careful, cautious race, never speeding more than was necessary, and taking every turn with a good allowance for safety. The wisdom of this was shown when his competitors began rolling into their pits, either out of the race entirely or out for repairs until all chance at the money was gone.

Billy Carlson, in the Maxwell, drove a similar race, though he did not even appear to be in the winning class until long after the sixtieth lap. Little attention was paid him by the crowds; only the experts in the Maxwell pits saw what he was doing and signalled their approval.

One serious accident marred the day's sport. Bob Burman, a post entry driver who drove the car vacated by Grant when he aligned himself with the Case forces, turned turtle, both Burman and his mechanician being injured. Burman's injuries were slight and after being attended at the emergency hospital on the grounds, he and his wife went back to watch the finish. Joe Cleary, the mechanician, suffered fractures of the thigh and two broken ribs. A spectator was injured when the Edwards Special threw a tire in taking one of the turns at high speed.

Tom Alley lost control of the Duesenberg in the thirty-seventh lap and tore through a fence barricade for a distance of 150 feet. Both Alley and his mechanician saved themselves by crouching in the hood of the car. O'Donnell, driving the other Duesenberg, was also wrecked. His car skidded, jumped a bale of hay and turned over. The two racers picked themselves up, badly bruised, but delighted to find themselves still alive. The car was damaged considerably, but went on its own power back to the pits. Harry Grant, driving Cooper's car, the big Case, was the victim of a peculiar accident. He came to the pit for gasoline, but due to a mistake, the gasoline tank was filled with water. The car lasted half a lap then went out. Minor accidents and trouble of various kinds gradually eliminated the field after the first twenty rounds.

80 M.P.H. on Straightaways

For the first ten laps the speed was excessive. Alley averaged close to 70 miles on hour for five laps, which meant over 80 on the straightaways. But the other drivers were not to be led on by such reckless work and held to a steady gait. Resta especially, refused to be excited by the lead of other cars. He drove a monotonous, steady race varying but a few seconds each lap. He and his car resembled in their humming speed a huge bumblebee intent on reaching home. Nothing could turn them aside, nothing could stop them. The effect on the drivers behind them must have been disheartening. Resta's pace soon told on Alley and the former relinquished his lead in the twentieth lap.

Eddie Pullen, who won third place in the Vanderbilt Cup race, furnishing the greatest thrills of the day

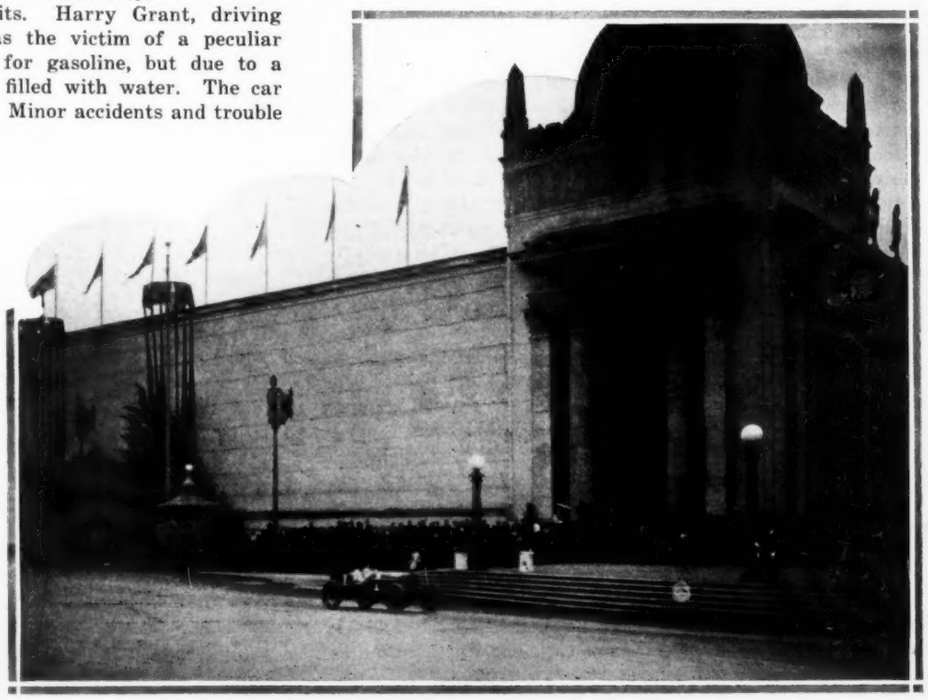
Nerve-Racking Pursuit

Then the race between Resta and Pullen began. It was almost nerve racking, that steady, humming pursuit. Pullen was first across the finish line after Resta and was hailed as second place man, but when the time allowance was estimated, Wilcox, the next finisher, was given second. Just a minute and 1 second separated first and second place. Barney Oldfield, always a favorite, puffed in after a steady race and much engine trouble, in seventh place. Disbrow, fifth in the Grand Prix, came eighth today. In every way the Vanderbilt was what the Grand Prix was not. Fair weather, a large crowd and dry track made the Vanderbilt a race, not a dismal mud fest. In spite of the forebodings expressed last week by drivers and spectators the classic of automobile racing was a success.

An interesting feature of the race is the fact that Resta used the same Nassau tires with which the machine was equipped in the Grand Prize race the week before.

Equipment on Cars in Vanderbilt Race in Order of Finish

Car	Driver	Carbureter	Magneto	Plugs	Tires	Oil	Wheels	Motometer
Peugeot	Resta	Master	Bosch	K. L. G.	Nassau	Oilzum	Rudge	Boyce
Stutz	Wilcox	Schebler	Bosch	Bosch	Silvertown	Monogram	Houk	Boyce
Mercer	Pullen	Rayfield	Bosch	Bosch	Silvertown	Oilzum	Rudge	Boyce
Mercedes	DePalma	Rayfield	Bosch	Bosch	Nassau	Monogram	Rudge	Boyce
Maxwell	Carlson	Harroun	Bosch	Rajah	Silvertown	Oilzum	Houk	Boyce

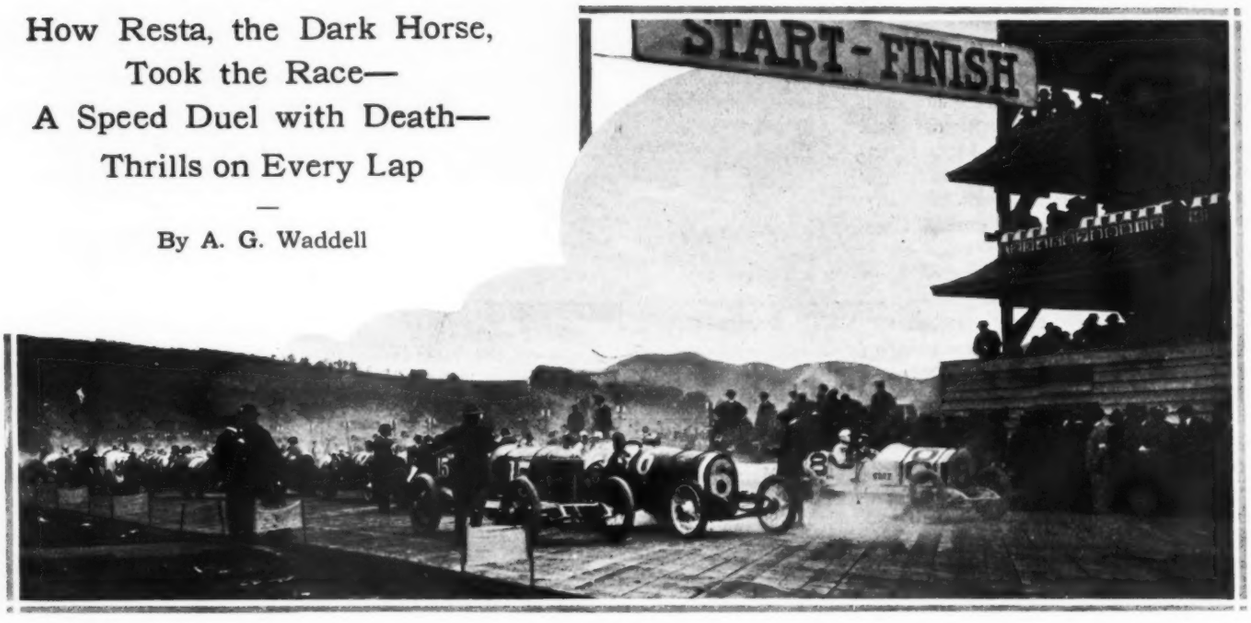


Barney Oldfield's Maxwell passing the column of progress during the Grand Prize Race at San Francisco, February 27. Barney Oldfield finished seventh in the Vanderbilt

The Winning of the Grand Prize

How Resta, the Dark Horse, Took the Race— A Speed Duel with Death— Thrills on Every Lap

By A. G. Waddell



The high-powered racers lined up just before the start of the Grand Prize race at the Panama-Pacific Exposition, February 27

SAN FRANCISCO, CAL., March 2—The clicking of the telegraph instruments in the press stand stopped for a moment, and in the pause an operator leaned back in his chair and said, "Gee, he was a fifty to one shot before the race! Resta certainly fooled me."

The words of this operator sum up the condition of mind of half of those who saw a comparatively unknown, and at least unheralded driver, carry away one of the most coveted cups of the automobile racing world. But not a soul who saw the nervy, skillful driving of the English-Italian had aught but praise for him. His skill was acknowledged; it was too evident to be otherwise. But the real admiration of the crowd was of a different sort. It was similar to the admiration of a small boy for the man who leaps the gap on a bicycle. It was a mixture of wonder and amazement at the audacity of the driver whose fearlessness carried him at breakneck speed over a course where death continually lurked.

How Resta Felt

Resta very naively says, "In such rotten weather the course was hard to drive." He might have said much more. He might have told of the terrible beating of the rain in his eyes and face, for water coming with a 57-mile head has a sting to it. He might have said something of the sensation of driving through a lake at close to a mile a minute pace and of the regular drenchings which came with each lap. There are many things each driver who stayed fifty laps could tell, but Resta merely says "the course was hard to drive." No wonder Resta is the hero of San Francisco.

True, he had good luck. He came to the pit but twice, once for gasoline and oil, again to change to non-skid tires. He made no mechanical adjustments and the car was running as sweetly at the finish as at the start.

But in this sort of race it is not the machines which interest so much, for they hardly had a chance to warm themselves by speed, but it is the human being who can endure hour after hour and give every vestige of his strength to the gamble between winning speed and lurking death. That is what lends the human touch and that is what makes the remembrance of the race rest not alone with one car or another but with the men who stayed in. It was not so much a race of cars and speed as it was a race of men. The man who was willing to take the most chances and who had the stamina and strength to withstand the cold and beating rain looms far greater in the popular mind than the actual performance of the machines.

The Course

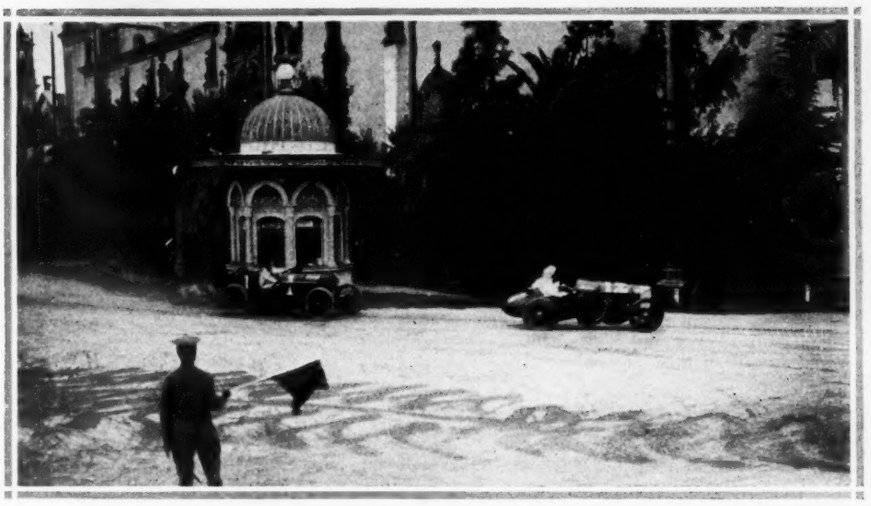
Rain had fallen until 3 days before the race and by the time the course had been put into condition the drivers had

TABLE SHOWING TIMES MADE BY DRIVERS

Car	Driver	5	10	15	20	25	30	35	40	45
9—Peugeot	Resta	18:13	35:44	53:07	1:11:35	1:32:37	1:57:29	2:22:24	2:43:24	3:03:30
26—Stutz	Wilcox	18:46	37:04	55:07	1:13:55	1:35:56	2:03:12	2:24:41	2:45:36	3:05:43
28—Ono	Hughes	18:57	40:03	1:01:54	1:21:10	1:43:45	2:05:38	2:26:14	2:46:31	3:07:34
5—Stutz	Anderson	18:39	36:47	54:56	1:14:36	1:39:53	2:07:34	2:30:47	2:52:45	3:13:21
12—Simplex	Disbrow	20:59	39:48	58:57	1:18:24	1:43:39	2:07:08	2:29:37	2:50:25	3:10:12
10—Mercer	Nikrent	19:06	37:42	56:41	1:17:08	1:42:07	2:07:39	2:35:33	2:56:40	3:16:16
30—Case	Grant	18:50	38:29	58:37	1:18:26	1:46:15	2:10:45	2:33:10	2:54:03	3:13:24
31—Overland	McKelvy	20:16	40:04	1:00:26	1:21:36	1:50:39	2:17:08	2:45:52	3:07:47	3:28:36
32—Maxwell	Carlson	18:36	36:18	53:54	1:12:53	1:35:37	1:59:57	2:22:09	2:43:40	3:04:11
15—Delage	Newhouse	20:01	38:50	58:53	1:28:02	1:54:50	2:20:38	2:44:32	3:07:47	3:29:43
3—Tahis	Gable	20:09	42:48	1:06:08	1:29:49	1:58:54	2:25:43	2:50:34	3:12:49	3:33:35
20—Chevrolet	Durant	19:46	39:03	58:26	1:19:15	1:47:21	2:15:16	2:41:39	3:04:49	3:25:20
2—Duesenberg	Alley	18:22	36:06	53:30	1:12:57	1:36:06	2:02:00	2:26:11	2:49:09	3:09:07
11—Edwards Spl	Kennedy	22:16	43:02	1:05:36	1:31:53	2:05:53	2:37:29	3:00:26	3:21:23	3:42:05
29—Alco	Taylor	21:21	42:10	1:03:54	1:27:16	1:59:56	2:28:35	2:55:18	3:19:18	3:41:22
18—Chevrolet	Lecain	20:30	43:17	1:03:57	1:26:15	1:57:29	2:26:00	2:51:52	3:13:38	3:34:11
4—Mercer	Pullen	20:47	39:46	58:06	1:17:18	1:42:09	2:06:06	2:29:40	2:53:16	3:12:58
6—Mercer	Ruckstell	17:57	35:53	53:40	1:13:10	1:36:54	2:02:06	2:26:26	2:52:08	3:12:08
22—Mercedes	DePalma	18:47	36:53	54:58	1:14:20	1:40:01	2:06:06	2:30:30	2:53:34	3:14:00
21—Case	Hearne	18:56	40:46	55:33	1:15:58	1:44:33	2:13:16	2:39:20	3:02:36	3:23:27
35—Gordon Spl	Gordon	20:22	43:57	1:04:24	1:26:34	1:55:02	2:21:49	2:47:26	3:11:38	3:32:53
19—Duesenberg	O'Donnell	19:05	37:57	56:46	1:16:18	1:45:43	2:11:57	2:35:21	2:56:50	3:16:56
16—King	Klein	20:26	39:29	59:25	1:19:40	1:49:08	2:15:04	2:39:34	3:09:28	3:29:55
24—Parsons Spl	Parsons	19:12	41:47	1:12:07	1:39:01	2:09:26	2:36:31	3:02:07	3:24:36	3:44:28
17—Maxwell	Rickenbacher	19:52	36:59	55:53	1:29:17	1:54:10	2:17:37	2:40:48	3:21:16	Out
14—California	Bragg	19:01	37:49	56:55	1:17:34	1:46:00	2:16:26	Withdr	awn	
1—Maxwell	Oldfield	18:59	37:53	56:25	1:15:30	1:37:29	2:38:43	Out wi	th brok	en pin-
7—Edwards Spl	Gandy	19:28	41:51	1:01:29	1:21:33	Wrecke	d			
27—Bugatti	Marquis	20:13	Out	with ign	ition tro	uble				
8—Stutz	Cooper	Out	with	broken	cranke	ase				

just 2 good days in which to practice. The planks which had been hurriedly put down to cover the portion of the track not paved were warped and twisted from the rain and sun. A crew set to work to tear up the most dangerous parts and to place new underpinning in the mire below. When this work was done the planks were hewn and cut until they approximated smoothness, but even this failed to remove the roughness.

Though the unevenness of the boarded section was bad enough at the start, it was made far worse when the rain began. The partly dried earth underneath took the water readily and pounding cars churned the mud into a thin, greasy liquid. When a car would reach the boarded track each individual plank seemed to take a delight in spitting muddy phlegm at the occupants. The continual poundings soon loosened the planks and in several places they settled slowly into the mud, making dips and dives over which the cars hurdled like runaway roller-coasters. Someone on the grandstand, who was cheerful, though wet, said that it was the first time that he ever saw a 100-horsepower automobile do the tango. And the way the machines slid and hopped down that bumpy track was not unlike some of the gyrations of the modern dance.



Disbrow, in a Simplex, winner of fifth place in the Grand Prize race, held February 27, followed by Barney Oldfield, taking the right angle turn from the straightaway on the Avenue of Palms to the Avenue of Progress

Greasy Pavements

Oil and water combined to make the paved stretches desperately dangerous. Jim Parsons found himself and his car whirling wildly around and coming to a stop headed straight for the bay. O'Donnell, in his Duesenberg, seemed to bear a charmed life. He took the greasy right angle turns with a nonchalance that brought him within an inch of destruction. A good dozen times he grazed the straw embankments; twice he whirled completely around. A couple of others shed tires. Cable drove a tire from his Tahis for a full block. An innocent guard attempted to capture the runaway and was promptly bowled over, while the tire continued merrily on its way.

In front of the Philippine building on one of the turns of the course spectators were kept in a continual fever of excitement. Disbrow lost control of his Simplex here on one occasion and landed with the front wheels driven into a straw pile. A quick examination of the car showed that no damage was done and the plucky little driver was off again. Nikrent had a narrow escape from a serious accident at this same spot. He literally dived into the pond which had filled the track and before he emerged his car began to skid. Before the Mercer stopped it had ripped out a section of the fence along the track. Nikrent lost no time, however, and before the guards could reach him he had pulled the splintered pieces loose and was on his way.

But one real accident marred the day. Lou Gandy flew from the track on the approach to the Grandstand straightaway and dashed into the bank. Happily, the bank was wet and soft and the damage was confined to a broken steering gear and a bent axle. A black cocker spaniel dog was the most dangerous thing on the course for 15 minutes in the afternoon. The dog was bewildered by the roaring machines and dashed wildly up and down the track. Fearing their own safety more than that of the dog the drivers swerved from side to side to avoid the animal. Barney Oldfield came within an ace of giving the pup his final joyride, but luck was with the dog and he escaped to edge of the track where he was leashed.

EVERY FIVE LAPS IN THE GRAND PRIZE RACE

50	55	60	65	70	75	80	85	90	95	100	104
3:22:44	3:42:51	4:00:47	4:19:25	4:42:10	5:04:21	5:25:54	5:46:46	6:07:41	6:28:52	6:50:20	7:07:53
3:25:14	3:44:35	4:03:27	4:28:32	4:50:00	5:10:54	5:31:22	5:54:03	6:14:16	6:35:22	6:56:43	7:14:36
3:26:50	3:48:02	4:06:56	4:27:37	4:49:23	5:11:01	5:32:11	5:53:08	6:13:57	6:45:07	7:05:12	7:21:46
3:35:58	3:54:15	4:12:40	4:34:27	5:01:21	5:24:28	5:46:10	6:07:32	6:28:18	6:49:47	7:12:46	7:30:21
3:34:19	3:53:04	4:12:14	4:38:54	5:02:26	5:24:45	5:46:24	6:08:11	6:29:36	6:51:16	7:13:43	7:31:38
3:35:21	3:57:16	4:17:17	4:41:15	5:03:51	5:32:03	5:53:54	6:18:37	6:41:37	7:06:50	7:30:51	Flagged
3:32:23	3:50:43	4:12:24	4:38:31	5:02:47	5:25:30	5:47:33	6:12:45	6:34:56	6:59:35	7:30:15	Flagged
3:44:46	4:09:39	4:34:02	4:58:17	5:21:26	5:43:52	6:01:34	6:19:33	6:42:11	7:06:08	Flagged	
3:23:43	3:42:44	4:01:30	4:22:00	4:53:58	5:24:06	6:08:22	6:31:17	6:56:13	7:23:14	Withdrawn	
3:51:25	4:13:04	4:40:00	5:06:43	5:32:38	5:58:11	6:24:33	6:51:54	7:20:07	Flagged		
3:56:14	4:17:33	4:46:18	5:14:04	5:40:39	6:05:47	6:31:09	6:58:48	7:25:47	Flagged		
3:45:19	4:08:53	4:38:59	5:06:45	5:34:32	6:01:35	6:29:05	6:57:58	7:28:34	Flagged		
3:27:52	3:50:26	4:08:42	4:51:55	5:18:40	5:44:03	6:10:31	6:36:50	Withdrawn			
4:03:39	4:36:40	5:06:17	5:32:02	5:57:30	6:23:10	6:46:15	7:18:36	Flagged			
4:02:52	4:32:16	5:08:47	5:46:36	6:14:25	6:42:32	7:10:55	Flagged				
3:54:13	4:13:59	4:38:52	5:12:13	5:41:12	6:13:16	6:48:07	Withdrawn				
3:31:53	3:50:18	4:08:56	4:36:35	4:59:15	Withdrawn						
3:31:08	3:51:19	4:09:16	4:42:01	Withdrawn							
3:33:00	3:51:41	4:12:37	Withdrawn								
3:39:54	4:03:52	4:33:19	Withdrawn								
3:53:00	4:14:40	4:47:31	Withdrawn								
3:35:35	3:50:15	Withdrawn									
3:49:40	Out with piston										
4:04:00	Withdrawn										
with fo	uled spark plugs										
ton											

Henry Leaves Peugeot to Design Aviation Motors

PARIS, FRANCE, Feb. 18—M. Henry, designer and chief engineer of the racing department of the Peugeot company, has severed his connection with that concern in order to join the Bariquand company, of Paris, for whom he will produce aviation motors to be used on French aeroplanes and hydroaeroplanes. These new motors will be eight-cylinder V-type of the same general design as the Peugeot racing type. Two models are to be built, of respectively 3.9 by 7.08 ins. bore and stroke and 3.6 by 6.4 ins. bore and stroke. These dimensions correspond to the 1913 Grand Prix Peugeot which won at Amiens, and the 1914 Grand Prix cars used at Lyons. The larger motor will develop about 250 horsepower, while the smaller will show 200 horsepower. This is a higher power than usually employed on French aeroplanes, where the tendency has been to use light-weight rotary Gnomes. It is understood, however, that the motors produced by the ex-Peugeot engineer will be fitted only to the new bigger types of armored aeroplanes.

The departure of Henry makes a serious break in the Peugeot racing camp. The extraordinary success of this racing team has been due to the happy combination of the late Paul Zuccarelli, a man of original ideas; Henry, an engineer of great merit, and the skill and daring of the race drivers. Only the race drivers are now left, and they are scattered by reason of the war.

Americans Speed Up French Factories

Experts Increase Results from Machine Tools 50 to 100 Per Cent.—Car Plants Still Making War Supplies—Makers Fear Difficulties in Resuming Car Building After War—Expect Large Demand

By W. F. Bradley
Special Representative of THE AUTOMOBILE *with the Allied Armies in France*

PARIS, Feb. 18.—Trade conditions remain brisk in the French automobile industry by reason of the contracts placed by the army authorities. There is very little similarity, however, between the factories as they exist at the present moment and their condition a year ago. Entire staffs have been changed. When the war broke out about 85 per cent. of the men in the French automobile industry were immediately called into the army. The 15 per cent. remaining represented men beyond the military age or who were excused military service by reason of some physical disability. After about 6 weeks' fighting a complete plan was developed by which the automobile factories should supply war material to the army, this material to comprise guns and ammunition as well as various types of automobiles. In order that this work could be carried out the heads of departments and a certain number of workmen had to be released from active service in the army and returned to their original employment. The men released were not sufficient for the work in hand and labor has been sought in every available quarter. Many of the factories around Paris are employing Belgian soldiers in uniform. These men are sent from the front in order to recuperate. They are employed in the automobile factories for a few weeks, where regular hours, good food and comfortable lodging, together with the satisfaction of drawing a better wage than the soldier's pay, put them again in condition for taking up their place in the fighting line. These men may continue this work after the war.

Banker as Stoker

Skilled Belgian artisans also find ready employment in the French automobile factories. Many of the factory laborers are also Belgians. Some of these men possess an excellent education and held important positions in their own country before the war. They are glad to handle a shovel pending the termination of hostilities. In the Renault factory a former Belgian bank manager was pointed out to me in the role of a stoker; and in the Darracq works a rich Belgian who had lost everything but his six-cylinder automobile was handling shells as they came out of the hardening furnace. The automobile, although nominally his property, was not available for his use or sale, for it was held up at Dunkirk by the army authorities, who refuse to allow any civilians' cars to leave that town on any pretext whatever.

Open air automobile repair workshop behind the French lines

Busy on War Material

All through the winter the French authorities have been making full use of the automobile factories for the production of shells, machine guns, trench mortars, aeroplane darts and bombs. So thoroughly has this work been organized that the Allied forces have as many guns as they can possibly employ and a greater quantity of ammunition than is likely to be exhausted under the most prolonged and severe fighting. The most important item in the automobile factories order is the production of 75 mm. shells and shrapnel. Although the mines and steel and iron works in the north are occupied by the enemy, there has been no holdback in the product. Steel bar has been supplied very largely from England, the supply always being sufficient to keep the factories running at full pressure, and the stock in reserve at present time being sufficient for several weeks ahead. The shells are machined, hardened, tested for hardness and also under hydraulic pressure, and sent away daily to the government powder factories to be charged. The exact nature of the steel employed is a secret not revealed to the factory engineers.

Buy American Machine Tools

The activity of French automobile factories on army contracts has had its influence on American machine tool firms. The head of one of the best equipped automobile factories in France told me that he had spent more money with American machine tool makers during the last 4 months than at any corresponding period of his firm's history. The activity in the American machine tool business is clearly visible at the docks of the leading French ports. America has this business practically in her own hands, for England is barely able to meet her own requirements, the French supply is low and Germany is obviously out of the market.

When getting in new American machinery several of the French factories have at the same time engaged the services of American experts in high-speed production. The works manager of one automobile factory told me that his American expert was getting from 50 to 100 per cent. more out of his machinery than it had ever been possible for them to produce under the best conditions. Formerly it was impossible to get the workmen to run the machines to their full capacity. Objections were made which the factory managers were unable to meet, or if the machines were speeded up the men would change the speeds back again. The expert knows what the machines can do, shows the machine tender how to do it, and insists on it being done all the time. This speeding up has been rendered easier by reason of the uniform nature of the work for the army.

Special Hardening Plants

Special hardening plants have been laid down in the leading automobile factories. The furnaces are specially designed to deal with shells. The furnace, which is heated with crude oil, has an inclined floor, down which the train of shells rolls gradually, the furnace being constantly fed at the upper end, and the 15 minutes necessary to travel from the upper to the lower end being sufficient to heat the shells to the required temperature. In this way the furnaces are constantly fed, day after day and night after night, while the treated shells are being withdrawn at the rate of about one every 2 seconds. The hardening plants used for varied automobile work were not usually suitable for the treatment of shells, thus these special plants have been laid down in record-breaking time.

Truck Plants Rushed

Those automobile factories specializing in trucks, or having facilities for armored cars, motorbuses, automobile searchlights, meat wagons, tractors, and the special types of machines required in army service, have received as many orders as they can execute. Touring car firms have been given big repair contracts for both the British and the French armies. Darracq, for instance, has taken over a big contract for the repair of touring cars and trucks belonging to the British Army. Not being fitted up to handle trucks as a complete unit, motors, gearboxes, axles, etc., are sent separately from the army repair depot, the necessary repairs and tests are carried out in the factory, and the units sent back to the army shops for assembly.

Cars in Good Condition

Touring cars and ambulances are sent complete. Whatever the nature of the car, whether it has a bent steering knuckle or has been lying in the bottom of a ditch for 2 months, the British army authorities insist on cylinders being lifted, pistons scraped, crankcases and gearboxes flushed, all external oil and dirt removed, and all working parts lubricated. This guarantees every car going out of the repair shop in good running condition, and it makes possible the detection of defects which the driver may have overlooked or omitted to report.

Above—Entrance to French trenches in the Argonne forests. Albert Guyot's Panhard limousine in the background

Below—Staff officers on a round of inspection of the French trenches in the Argonne district

Hard to Resume Car Building

While the heads of factories are satisfied with present conditions, they are looking ahead with a little apprehension. The present effort has been made in order to give the Allies a decided advantage in guns, ammunition, and all kinds of motor transport for the huge united effort which will be made to drive the German armies out of France and Belgium into their own country. The material position of the Allies has been so strengthened during the past few months that it is inconceivable that their forward movement should fail. When this movement has been carried out the special work of the automobile factories will have been brought to a close and manufacturers will be faced with the delicate problem of switching over from the making of shells and guns to the production of cars. It was easier to change from cars to shells than it will be to change back from shells to cars. When the first change was made definite orders with the government's backing were in hand. When car production has to be resumed conditions will be interwoven with the general trade conditions of the entire world. There will also be the special problem of getting forgings, castings, special steels and various components from the iron and steel district of northern France so long held by the enemy. Nobody can say exactly what trade and manufacturing conditions will be when the war orders are withdrawn. Hence a certain amount of anxiety on the part of the heads of factories.

Big Demand Expected

Some of the most capable men in the industry are so convinced that there will be a big demand for cars immediately after the war that they are doing everything possible to increase their stocks. The retail price of several makes of cars has been increased from 5 to 10 per cent. and in other cases the usual trade discount has been abolished. Foreseeing a shortage in Europe of raw and partly finished material, some French automobile directors have made or are making arrangements for American supplies, delivery to be made immediately after the war.

Three Broad Classes of Brakes

Diagonal Braking System Is Most Effective But Requires Complicated Mechanism—Transmission Type Powerful with Small Area—Experiments with Hydraulic Brakes—How Wear Is Compensated

By A. Ludlow Clayden

MORE attention has been given to the propelling than to the arresting parts of automobile anatomy. Motors and transmissions have improved out of all recognition while the almost more important brakes have been left severely alone; accelerative powers have increased enormously, but the retarding forces at a driver's disposal are usually no better than they were years ago.

What are the qualities desired in a brake?

1. It should stop the automobile in the minimum distance.
2. It should be durable so as to retain its power.
3. It should be easy to apply so that a woman can have the same power of safety as a man, for she has already the same power for speed.
4. The action should be free from jerks at all times.
5. Rapid stopping should not affect steering.
6. Adjustment for wear should be very easy.
7. There must be ample protection from mud or oil.
8. Minimum attention must be required for maintenance of efficiency.

There are three brake systems:

All brakes on rear wheels.

Pair on rear wheels and one on transmission.

Pair on rear wheels with second pair on front wheels.

The advantage of the first is that no braking stresses are thrown upon the axle gearing, though this is of small importance in these days, whatever it may once have been. The advantage of the second is that small, light drums only are needed on the wheels, and the gearbox brake is easy to protect or to adjust while having greater power in proportion as it is geared up by the bevels. The third has the advantage that great power can be combined with minimum effect upon the course of the car over greasy surfaces.

To take the whole theory of front wheel braking would require a great deal of space and serve no very useful purpose but it is roughly as follows. Putting on a front wheel brake tends to lock the front wheel and, if we suppose that the wheel does not slip along the ground, it is easy to see that there will be an effort made to lift the back of the car off the ground. This means that the effect of front brake application is to increase the pressure between the front wheels and the road by throwing the weight forward. Now the amount of force that can be applied to a brake before wheel lock begins depends upon the pressure of the wheel on the ground, and the front brake is powerful because it has the inertia of the car to help it. There is no such action with a back brake, so a front brake has more stopping power than any kind of rear wheel arrester.

It may be accepted as a fact that the arrangement wherein the brakes are linked diagonally is the best. In this system the left side front brake and right side rear one are interconnected and actuated by, say the pedal; while the other two brakes are operated simultaneously by the hand lever. The reason for this is that one then has always two wheels, one in front and one behind, free to roll, and it is only a rolling wheel that is of use to steer with. This diagonal system is expensive to make and not easy to design so that all the mechanical difficulties attendant upon front wheel brake operation are overcome. It is trouble in getting the connections rigid and reliable that has caused several makers to abandon the front wheel system after using it a short while. Also there is danger in having a pair of front wheel brakes that operate simultaneously because, if the wheels should be locked by too vigorous an application, then all steering power is lost and the car slides straight forward.

If front wheel braking is ever to become popular it is the diagonal system that attracts, but the manufacturing drawbacks are seriously in the way, though the immense success of the front wheel brakes used on the cars in the French

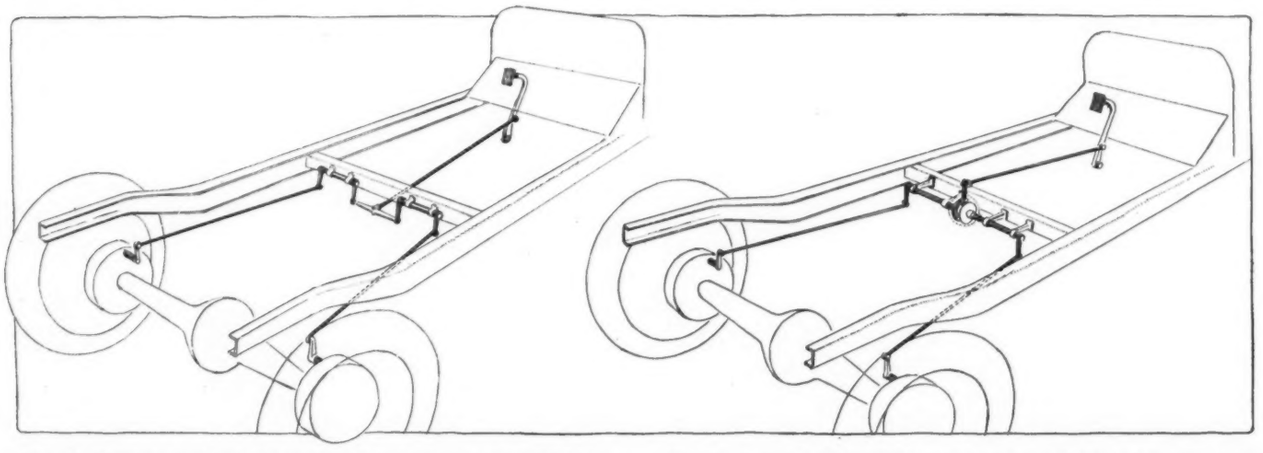


Fig. 2—Ordinary method of compensating brakes by balance beam. Pull is applied at center of beam and is divided between the two brake rods in proportion to the resistance offered, so that if one brake comes on first the other is pulled into action instantly

Fig. 3—A small differential gear can be substituted for the balance beam and gives smoother action, but it is, of course, more expensive, and, as a result, is found only on comparatively few high-priced cars. The illustration shows this arrangement

Grand Prix last year would certainly have had an effect in Europe had the 1915 designs come out in the ordinary way.

Figure 1 shows the mechanism of the Argyll front wheel brake and it is easy to see that there are a good many parts, and the manufacturing difficulty can be appreciated.

Compensation

When a single brake is used on the propeller shaft the differential takes care of the distribution of force to the two wheels equally, but this kind of compensation has a disadvantage, in that if the adhesion of the two wheels is greatly different, that with the lightest grip on the road may actually be caused to revolve backwards. This is shown by jacking up the rear axle and then turning one wheel while the brake is holding the drive shaft from turning. Still it is only on very rare occasions that this reverse motion happens and it is not therefore a cause of much added tire wear.

When there are a pair of brakes one in each rear wheel they may be compensated by applying the pull of the pedal or lever to the middle of a short beam, the brake operating rods being attached to the ends of the beam, as shown in Fig. 2. If this is not done the task of adjusting the brakes is rendered a good deal more delicate than it needs to be. On a few high priced cars the beam arrangement is replaced by a diminutive differential gear because the action is smoother and a much larger range of equalization is given; this device is shown in Fig. 3.

It is hardly necessary to remark that brake-operating rods are made straight on all well designed cars, because a bend in a rod means that it will be springy and spring means loss of power.

Brake-Shoe Patterns

In order that the surfaces of the brake shoes may wear evenly the mechanism ought to be such that the shoe presses with equal intensity upon the drum and does not bear harder at one end than the other. This cannot be done completely with the ordinary expanding brake, since the spreading cam opens the shoes on a hinge and, obviously, the ends of the shoes next to the hinge will be the first parts to make contact with the drum. Another trouble with the expanding brake, shown in Fig. 4, is that the action of the cam brings one shoe into action faster than the other since the top of the cam, in pressing the shoe, moves along a larger circle than does the bottom part. This action lessens as the cam approaches the middle position, but the tendency is to throw all the work of gentle braking on the one shoe. In Fig. 5 there is shown a way of overcoming unequal cam action by connecting the free ends of the brake shoes through a toggle arm. This distributes the pressure equally between the two shoes at all times and completely does away with any inequality in pressure. Of course, it is slightly more costly than the usual construction and it may perhaps be questioned whether the extra parts are really worth while. A clever attempt to overcome this is used on a small De Dion car wherein the brake lining is applied closer to the hinge pin on one side than on the other; this tending to balance the hastening action of the hinge against the retarding action of the cam as is made clear by Fig. 6. These little points are of most importance when the brake surfaces are all metal and do not matter very much if a woven fabric is employed, since the comparative softness and compressibility of the material evens up the action. With an external transmission brake it is possible to use balanced shoes like those of a railroad brake and this has been found the best type for London taxicabs, because it permits extremely quick and facile renewal

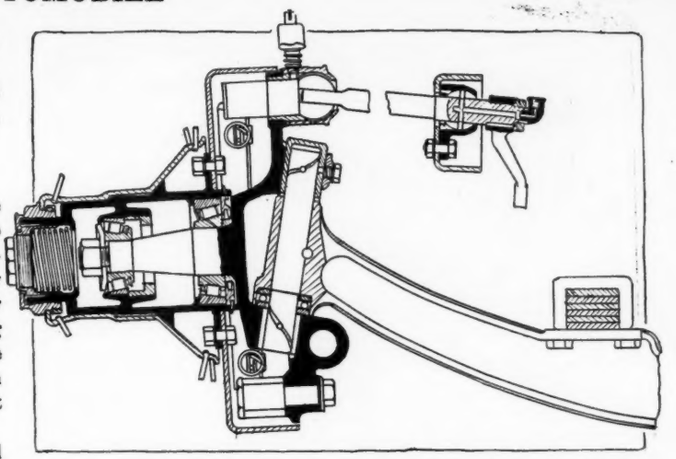


Fig. 1—Argyll front wheel brake operated through short universal shaft from bracket on frame sill. Universal at brake is located on same center line as steering swivel so expanding cam is unaffected by steering

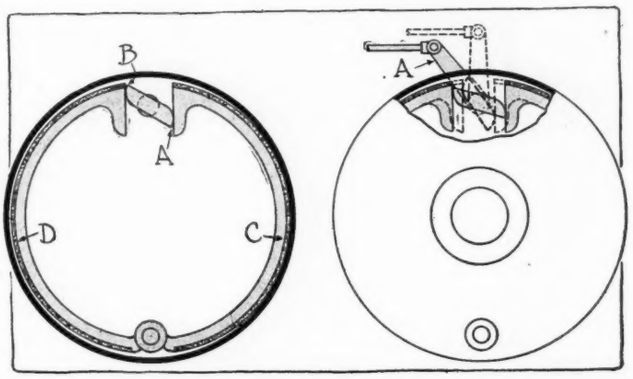


Fig. 4—Left—At beginning of motion, shoe C of brake tends to make contact with drum before shoe D, because the inner end A of spreading cam is nearer to brake center than the other end B. As cam approaches horizontal this effect vanishes

Fig. 9—Right—As the shoes wear away the lever operating the spreading cam sets further forward when the brake is applied, so that leverage is lost and more power is required in order to get the same stopping effect. The lever ought to be upright when the brake is on

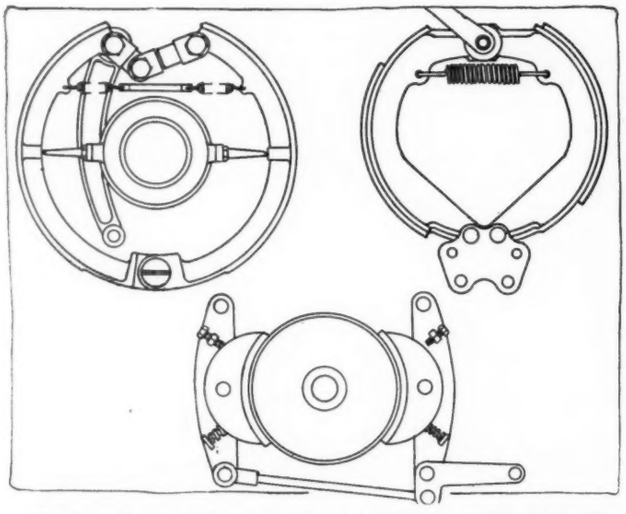


Fig. 5—Left—A device to overcome the trouble illustrated in Fig. 4. Instead of a spreading cam the toggle link is used and this balances one shoe against the other on the same principle as the balance beam compensates pull on rods. Fig. 6—Right—Method used on French car to compensate for unequal cam action by offsetting the lining pads on the brake shoes

Fig. 7—Below—Diagram showing the elements of the "locomotive" type brake in which the shoes approach the drum squarely and make contact over their whole faces simultaneously. This is, of course, only applicable to transmission location

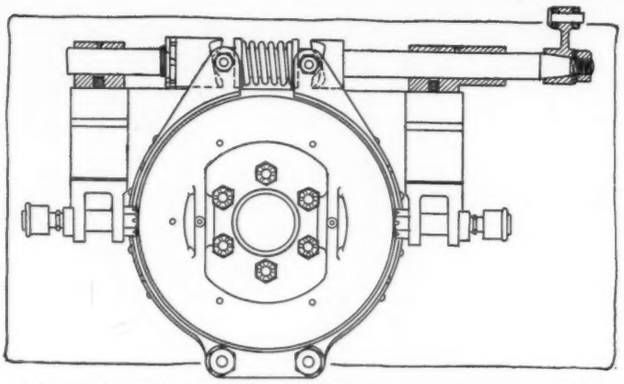


Fig. 8—Transmission brake with two fulcrum pins, contracted by the face cams seen on the top shaft. This is simpler than the type shown in Fig. 7 and practically just as good. It makes a most satisfactory and smooth acting brake

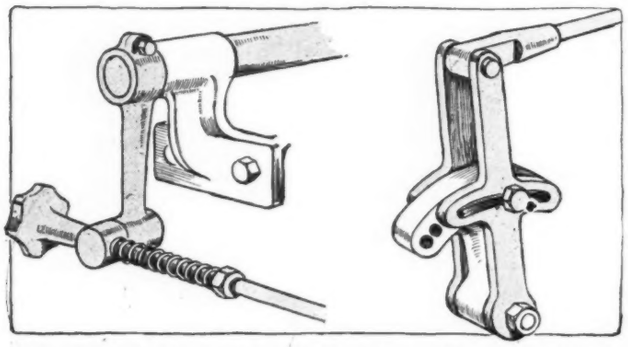


Fig. 10—Left—Hand nut for enabling the length of the brake rod to be altered without the use of tools. Fig. 11—Right—Setting for lever on the shaft of the spreading cam to allow the lever to be returned to the upright position of greatest effectiveness, when the shoes are let down by wear

of the shoes. Figure 7 is a diagram of such a brake and Fig. 8 shows a way of obtaining almost as equal an engagement by using two fulcrum pins instead of swinging both shoes from the same pin.

Most manufacturers find that the outside type of transmission brake is too costly and it cannot be inclosed, which is always a disadvantage. They therefore prefer to use a pair of expanding shoes of the same pattern as those in the rear wheel drums, and if these are of good width the action is practically as smooth. When such a design is employed, however, care should be taken to arrange the drum so that it can be detached without taking down the universal, for otherwise access to the shoes for renewing their linings will be difficult and costly in the repair shop.

The most satisfactory transmission brakes are not very large in diameter, but are very wide.

Good Points of Transmission Brake

The chief advantage of the transmission brake is that it is powerful by comparison with the pedal pressure needed to apply it and is therefore in accordance with requirement No. 3. It is also easy to supply a very handy and quick adjusting handle, so filling requirement No. 6. It is also possible to give complete protection in accordance with No. 7. By making it comparatively small in diameter and of considerable width, it fulfils all the other requirements except No. 5, for in this respect it is a little inferior to brakes on the wheels themselves.

Rear Wheel Brakes

The rear wheel brakes need to be as large as possible, the limiting factors being weight and the amount of space available. Roughly speaking power is determined by diameter and durability by width, but the diameter must be small enough to keep the drum off the road when the tire is running in a rut. Still it should not be forgotten that every inch added to the diameter means less effort is needed to provide a given retardation. Another point in design that is too often neglected is that the spreading cams should be large enough to allow the bulk of the lining to be used up. In very many brakes the adjustment is at the end of its travel long before the linings are worn out, and this means that the owner of the automobile is put to unnecessary expense for relining.

Adjustment of brakes should be possible at two points in the linkage, the first being at the extremities of the pull rods where they connect to the cam levers, and the second at the point where the levers are pinned to the shafts of the cams This is because the lever ought to be upright and in the position of greatest mechanical advantage when the brake is hard on, and if wear allows the lever to come more forward, leverage, and so power, is lost; this is explained by Fig. 9. Methods of providing easy hand adjustment without the need for tools are shown in Figs. 10 and 11.

A detail of brakework that sometimes gives trouble is the pull-off spring between the shoes, since this is liable to lose power through rusting. On one European car the usual helical spring is replaced with a flat leaf of spring steel that is more durable and rather more easy to put in place.

Another point that gives opportunity to the clever designer is the bearing of the short shaft that carries the spreading cam, because this has a tendency to clog with mud and water. Where money permits it is a very real advantage to bush this bearing with bronze as is done with the shackle pins on the springs of the more expensive automobiles, because a little rusting will not cause as much binding as it does where both the surfaces of the bearing are steel. It is necessary to allow for the fact that any greasers fitted to parts of brakework are difficult of access and therefore generally neglected by the user of the vehicle.

An Hydraulic Brake System

In the last illustration, Fig. 13, is shown an interesting form of brake that has been used experimentally only, but seems to possess possibilities worth investigation on a larger scale. Instead of using metallic connecting links between the hand lever or pedal and the brake shoes, there are pipes containing oil that can be put under pressure by a piston working in a cylinder and located centrally upon the chassis. In the experimental apparatus there were four similar brakes, one on each wheel, and there were two pressure pistons working in separate cylinders as is shown in the illustration. These oil cylinders were connected to the brakes by copper pipes with flexible ends and could be linked up so that one piston controlled either pair of brakes. Usually one cylinder supplied the front pair and the other the rear, but it was equally easy to link up diagonally and so obtain the advantage of this form of connection, which has already been ex-

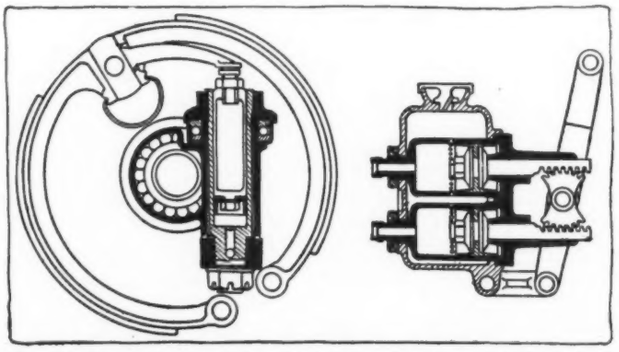


Fig. 13—Interesting arrangement for operating brakes hydraulically so that all four can be applied at once on front and rear wheels

plained. To overcome any leakage of oil the pressure cylinders were contained in an outer casing which could be filled through a plug in the top, and there was a ring of holes in each cylinder uncovered by the pistons when in the normal position. Should any oil have been squeezed out in applying the brakes more would flow through the holes to take its place, as soon as the pressure was released and the pistons allowed to return to the normal place. Of course the idea of using two pistons was to make one set of brakes independent of the other set, so that the accidental fracture of a pipe should not put all brakes out of action together.

The Band Brake

The still exceedingly common type of rear wheel brake consisting of an external band is not easy to praise on any score. It fails to comply with any of the fundamental requirements and has the additional disadvantage that it nearly always drags slightly upon the drum when supposed to be off. Also, since brakes operate as such by changing work into heat, it is scarcely a defensible practice to put two brakes on the same part of the same drum. Woven lining is not a good conductor of heat, so all that is generated has to escape by the drum, and this cannot dissipate its heat so readily if it is encircled by a non-conducting band as if it is free to the air; the effect is that double braking on the same part of the drum greatly decreases the life of the latter and also tends to roughen it, which gives jerky action.

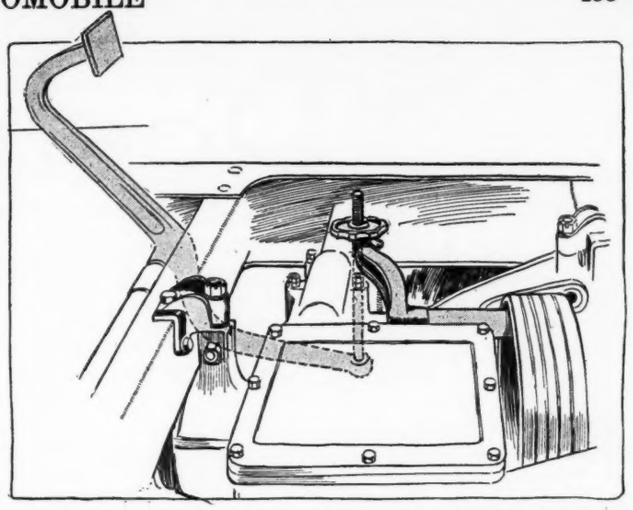


Fig. 12—Example of easy hand adjustment for transmission brake

Signs were not wanting at the Shows that the band brake is losing the hold it has had so long, and just as soon as the users of the new cars with two sets of expanding brakes find out how much less trouble they are, and how much more satisfactory, they will never again accept an automobile with the inferior stopping mechanism.

Recent Court Decisions—Bicyclist Sues

By George F. Kaiser

WHEN a bicyclist and a motorist collide, it is a question for the jury to decide who is actually at fault, was held by a Missouri court in a recent case.

A bicyclist sued for damages for personal injuries, which he contended were caused by the negligence of the motorist. The bicycle was going east and the automobile was going west. The motorist contended that the bicycle swerved into the car, while the latter claimed that the former suddenly turned south and hit the wheel.

The court decided that the matter was for the jury to say who was at fault.—*Harris vs. Pew*, 170 *S. W.* (*Missouri*), 344.

Collision with Freight

A railroad company is only required to provide flagmen, gates, signal lights, etc., at crossings where they may be reasonably necessary.

A motorist sued a railroad company for damages resulting from a collision between his car and a freight train which was standing motionless on a spur track across a public highway. The company had provided no flagman. The motor car was proceeding at a speed of 20-25 miles per hour; its head lights reaching 100 feet ahead. The night was dark and hazy and the motorist's vision was affected by an arc light which he had just passed and he did not see the cars until a few feet away.

Despite the fact that there was no flagman, signal lights or electric signals, the court held that the railroad company was not negligent under the circumstances, and the motorist could not recover the amount of damages he suffered in the collision.—*Frank vs. Boston & Maine R.R.*, 106 *N. E.* (*Massachusetts*), 1022.

Motor Vs. Motor

In Minnesota the rule of the road that a motorist must keep to the right, was explained in a recent case.

An action was started for damages caused by a collision between two automobiles on the theory that one of the motorists was at fault because he had not kept to the right. An electric automobile was being driven south on a street about 3 feet from the right curb in a careful and lawful manner. The gasoline car was being driven north on the same street about 6 feet from the right curb at a speed of about 10-15 miles per hour. A third car was being backed out of an alleyway, having no lights and without giving any warning. The operator in charge of the second car applied his brakes and attempted to turn to the left to get around the car which was backing out. The pavement was wet and slippery and the car skidded, the front of the car striking and damaging the machine which was coming in the opposite direction. Its owner sued for damages to the car but the court held that the rule as regards keeping to the right had no application under the particular facts in the case and refused judgment for the damages.—*Chase vs. Tingdale Brothers, Inc.*, 149 *N. W.* (*Minnesota*) 654.

Must Look and Listen

Suit was started against a trolley company by an automobilist whose motor truck had been damaged in a collision with a trolley car.

The motorist contended that the car had been run at a speed of 30 miles per hour and that no gong had been sounded, which was a violation of a city ordinance. Trees and shrubbery obstructed the motorist's view of the crossing, so the speed of the truck which had been reduced to 12 miles per hour was reduced to about 6 miles per hour. While 35 and 25 feet away from the crossing the operator looked to see if a car was approaching but saw none until the motor truck was struck.

The court held that the railroad company was not responsible in damages for the accident as the motorist should have made another observation, as cars coming at high speed were to be expected at that place and further that it was his duty to look and listen continuously until the crossing was reached.—*Voelker Products Co. vs. United Railways of St. Louis*, 120 *S. W.* (*Missouri*) 332.

Reliners Not for New Tires

EDITOR THE AUTOMOBILE:—Would a new tire casing be injured by putting in a reliner? Personally I should think a reliner put in a new tire would give it added strength and also prevent blow-outs and most punctures for it would make a thicker casing for nails, etc., to go through to reach the tube. However, a pamphlet I read recently on the care of tires claimed that reliners are injurious to new casings, but gave no reasons.

Greenville, Pa. PAUL R. MOYER.

—It is a general opinion that a new tire casing would be injured by putting in a reliner unless the tire was quite worn out. On the other hand, the use of liners in old casings is a great factor in increasing the mileage. To use the words of one manufacturer of liners:

"We do not recommend the use of reliners in new tires. The use of reliners is advisable only to prolong the life of worn casings and is a sort of reinforcement in the case of worn and broken fabric where the automobilist does not feel that he has sufficient mileage from his tire to warrant the expenditure of the price of new tires. Used in new tires the friction necessarily resulting is only harmful to the carcass of the tire and a decreased mileage is bound to result. No matter how carefully reliners may be applied or how skilfuly they may be cemented to the inside of new casings the union between the reliner and the fabric of the casing is such that heat is bound to generate and damage result. While it is difficult to determine just what effect the use of reliners has on new casings, we believe that the experience of all tire manufacturers is the same and that if the tire manufacturer felt that the additional plies of fabric in the casing were beneficial to the general result he would adopt a tire built with extra plies of fabric to take the place of the reliner in all casings.

"We make no claims for increased mileage in the use of our reliners. The condition of the casing at the time the reliner is applied will have much to do with the mileage resulting from the use of reliners. As a matter of fact, any attempt to make definite claims regarding mileage resulting from the use of reliners is out of the question and statements regarding mileage results obtained are usually visionary rather than real."

Constant Mixture Not Always Best

Editor THE AUTOMOBILE:—I read with interest the article on carbureters in a recent issue of THE AUTOMOBILE and would like to ask the following questions:

1—Do you mean in your first sentence by a suitable mixture, a constant mixture?

2—Is it a constant mixture that is most efficient for a carbureter to supply at all the varying speeds of a given motor?

3—If not, why not?

4—If so what is the approximate volumetric proportion of gasoline to air that gives the most efficient mixture under the ordinary atmospheric condition in a few of the common types of automobile engines?

5—Does the proportion of gasoline to air seem to have, for the most efficient mixture, any particular relation to the size of the cylinder, amount of compression, etc.?

6—If not, why not?

7—Why will not the proportion of gasoline to air remain a constant for the most efficient explosive mixture when the gasoline is of a definite specific gravity and the air constant in regard to moisture and density?

Hopkinston, Mass. FRANK A. REECE.

—1—By suitable mixture is not necessarily meant a constant mixture but that which meets the condition under which the motor is operating at the time.

2—While theoretically there would naturally be a mixture that would possess the property of greatest explosive power under practical conditions it is probable that higher efficiency is secured when a richer mixture is supplied at low speeds and a leaner mixture at high speeds.

3—This is answered under 2.

4—It has often been stated that under average conditions, a mixture by volume of 16 to 1 gives good results. It must be remembered that the range of explosive mixtures is quite broad and, while a perfect mixture theoretically is one in which there is just sufficient oxygen present to unite with the fuel in the proportion to form the most stable compound, or, in other words, a minimum of CO and a maximum of CO_2, in practice the best mixture would contain more than the theoretically required amount of oxygen. How much more than the amount theoretically required depends upon the variable features of manifold design intake manifold jacketing, whether or not the air entering the carbureter is preheated, and many other features which vary for each motor. For this reason it is always necessary to have a needle valve adjustment or something corresponding to it in order to set the primary adjustment of the carbureter to the proper proportion for the particular motor to which the carbureter is fitted. After this it is the function of the carbureter to retain this proportion for all motor speed with the variations necessary to create the best conditions.

5—The proportion of air to gasoline does not seem to bear

any definite relation to the size of the cylinder although it may to the amount of compression and other factors.

6—The size of the cylinder would not alter the proportion necessary because the carbureter and manifold size is designed to meet the requirements of the cylinder size, but the amount of compression may have an influence in affecting the homogeneity of the mixture and hence its combustibility under conditions of different proportions of air to gas.

7—There are two methods of judging the efficiency of fuel combustion in a gasoline motor; one is by economy and the second is by power. The correct power adjustment in a carbureter is never the one which is the most economical. The reason for this is that after a car has been brought up to a certain speed, the power required to keep it running at that speed on a level road is relatively very slight. Hence, the number of heat units in the shape of fuel which it is necessary to consume in the cylinder is not the maximum which could be consumed at the motor speed required to keep the car running at the rate in question. On the other hand where the maximum power of a motor is to be required such as for running at high speeds, or through continually varying conditions of grade, etc., it may be necessary to set the carbureter to produce maximum power and to sacrifice accordingly a certain amount of economy. Following this through, the reason for a varying condition of mixture for low speed and high speed work may be, without going too deeply into the theoretical end of the question, that at low speeds a heavy sustained torque is required, while at high speeds a quick-firing, snappy mixture is sufficient.

Again, the rate of combustion depends to a large extent on the compression. Compression is higher at high speeds that it is at low speeds and hence the conditions of combustion are different.

Reasons for the Steam Car

Editor THE AUTOMOBILE:—1—What are the relative merits and demerits of steam propelled automobiles in their present form?

2—Could a steam condenser of some kind be made for this style machine, thus making possible long runs without the addition of water as is now necessary? If so, how?

3—What is the reason for the abandoning of the two-speed axle on the Cadillac and of the electric gear shift on the Haynes?

4—If possible, kindly give a diagram of the new Entz magnetic transmission as used on the Owen magnetic car.

5—How does the percentage of power actually delivered to the wheels with this type, compare with that transmitted by the usual sliding gears?

Lexington, Va. J. H. FORBES.

1—Two reasons have generally been advanced for the small relative popularity of the steam car as compared to the straight gasoline vehicle. These are first the limited distance which they can go upon a definite quantity of water and secondly, the complicated method of starting and controlling them by means of the pilot flame and various valves and other devices. It is stated that one of the large manufacturers is shortly to introduce a much improved type of steam vehicle which is intended to overcome these specific objections together with those of appearance.

2—Steam vehicles have been operated with a condenser. The Doble steam car used a honeycomb radiator for a condenser and avoided the deposits on the surface of the radiator due to introducing the lubricant with the steam by using a special form of oil which would not so deposit.

3—The reason generally assumed for the abandonment of the two-speed axle on the Cadillac is that in the introduction of the eight-cylinder car it was not felt necessary to employ the two-speed axle. The electric gearshift was discontinued on the Haynes car because certain improvements which have since been made were lacking and trouble was had with the apparatus. It is stated, by the Haynes company, however, that the electric gearshift as now made has overcome these difficulties.

4—A diagram of the Entz magnetic transmission was published in THE AUTOMOBILE for July 2, 1914, on page 8.

5—As yet we have not had the opportunity of examining any figures on the transmission efficiency of the Entz drive.

Charging Battery from 125-Volt Dynamo

Editor THE AUTOMOBILE:—Will you kindly advise me whether it would be possible to charge a 6-volt 60-ampere storage battery from a 125-volt 3-ampere (kilowatt .375) shunt wound direct current generator. If so, I would thank you to advise me how to make the connections.

The repairmen and storage battery people here do not seem to know how to connect up a regular charging outfit, and the opinions regarding storing as I mentioned are varied. Some tell me that the voltage makes no difference and just to connect it up anyway, while others state a certain amount of resistance is necessary, but it can be seen that with a machine of this size the resistance would probably cut down the charging capacity.

Montgomery, Ala. F. A. BIVINS.

—The best way to accomplish this would be to place in series with a battery a bank of carbon lamps, Fig. 1. This in turn would be connected to the 125-volt circuit, at the same time taking care that the positive terminal of the battery is connected to the positive side of the generator. The lamps of this bank should be in multiple and the number used would depend upon the charging current and the candlepower. The normal charging rate is probably given on the name plate, and from this the number of lamps can be calculated. For instance, if the current is to be 10 amperes, it would require ten 32-candlepower carbon lamps in multiple or twenty 16-candlepower carbon lamps. The lamps as stated are in multiple and the bank is in series.

The voltage required for charging a 6-volt battery is approximately 6 volts at the start of the charge and 8.1 volts at the finish. This being true, it is necessary to either reduce the voltage of the 125-volt generator which may, however, be impracticable, owing to sparking and other troubles, or to insert a resistance as for instance the bank of lamps between the dynamo and the battery, thus absorbing the excess voltage.

The calculation required in determining the resistance is as follows: Resistance R equals $\frac{125 \text{ volts} - 6 \text{ volts}}{3 \text{ amperes}} =$ 39 2-3 ohms. The regular charging rate of a battery of this size is 8 amperes, but a rate of 3 amperes may be used for charging if necessary; at this rate it will not be necessary to taper the charge.

Replacing Brush Balance Gear

Editor THE AUTOMOBILE:—I have taken down an engine from a Brush car in which the gears were all broken. In replacing these gears, could you kindly tell me how the counter-

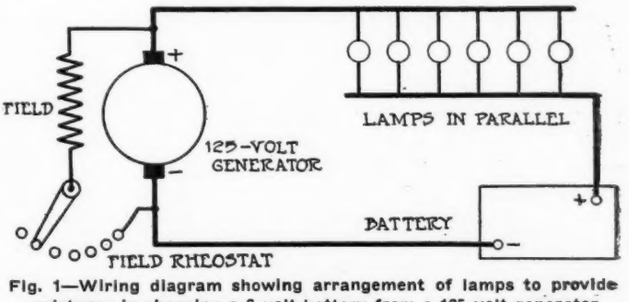


Fig. 1—Wiring diagram showing arrangement of lamps to provide resistance in charging a 6-volt battery from a 125-volt generator

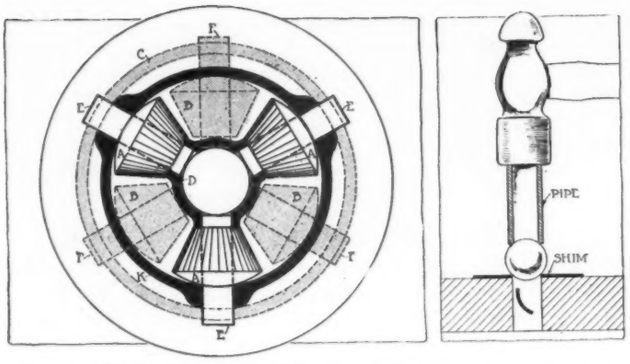


Fig. 2—Left—Use of six pinions in differential. Right—Cutting a round hole in a shim

balanced gear should be set; also publish the valve timing?

2—I have heard that this heavy counterbalance gear is not necessary in these engines, and that I can get along without it; is this so?

Gowanda, N. Y. L. C. BOLLER.

—The counterbalance gear was placed in the latest model of Brush cars to overcome the vibration of the one-cylinder motor. However, the car will run satisfactorily without the use of this gear, but the vibration will be more noticeable and more attention will have to be given to loose bolts and nuts.

To place the counterbalance gear in the motor, the gear is first assembled upon the stud and the motor is then placed upon top or firing center and the gear placed in position with the weight upon same being directly down the same as the weights upon the crankshaft.

The timing of the Brush runabout is as follows: The inlet valve opens after the piston has moved down 1-16 inch past dead center and closes when the piston has moved up 3-16 inch on the second stroke. The exhaust valve opens 7-16 inch before the end of the third stroke and closes 1-16 inch after the end of the fourth stroke, or just before the inlet valve again opens. The spark should occur a little before or after the end of the second stroke and depending upon the speed of the motor and regulated by the speed of the motor and the position of the spark lever.

2—This was answered above.

Wants Auxiliary Spring on 1908 Pierce

Editor THE AUTOMOBILE:—Will you advise me how to equip a 1908 Pierce Arrow 6-40 which has straight frame and semi-elliptic rear springs? Can I put on a three-quarter spring or auxiliary coils, or what?

Kennebunk Beach, Me. A. J. SMITH.

—It would be very expensive to put three-quarter elliptic springs on a Pierce Arrow 1908 40-horsepower six-cylinder car. If you added a good make of auxiliary spring, these could easily be attached to this model car and should give additional comfort, especially as regards small inequalities in the road surface.

Suggest Method of Adjusting Bearings

Editor THE AUTOMOBILE:—In adjusting conecting-rod and crankshaft bearings, the removal of one or more shims often makes the bearing too tight and I find it necessary to make a thinner shim to get the right adjustment. Also, in bearings without shims I prefer to file off a little too much from caps so as to make the bearing too tight to run. In this way I am absolutely sure the bearing has been taken up enough. Then by using a very thin shim on one or both sides of cap, as required, the bearing is just right. The next time the bearing needs adjustment the removal of shims is enough.

In making shims of very thin brass or steel, I found it difficult to cut the bolt holes satisfactorily till I hit on this way of doing it.

Place the shim on a piece of metal having a hole of the size desired drilled in it; hold a steel ball, larger than the hole, with a short piece of pipe or bushing—as illustrated in Fig. 2, directly over the hole with the shim between and give the pipe a sharp stroke with a hammer.

It will cut a perfectly round, clean hole, if the edge of the hole in the metal used is free from nicks.

The steel ball can be held better if soldered to the end of a pipe or rod.

This method can also be used on gaskets.

Worcester, Mass. CONSTANT READER.

Singing Noise on Down Grade

Editor THE AUTOMOBILE:—I have a 1914 model T Ford touring car. When running on the level or down grades at a fair rate of speed there is a singing noise that seems to be on the left side of the gearbox, but going up grade I can run as fast as I desire and the noise is not there. I can give the car a good start down grade and free the engine and you do not hear it any more until you engage the clutch again. It does not seem to injure the pulling at all, but it seems as if there were some parts rubbing. This has been in the car for a long time.

Jemison, Ala. C. M. THOMAS.

—From the description which you give it would seem that the noise is produced by the driveshaft pinion and the differential gear not meshing properly. In order to overcome this it will be necessary for you to install special heat treated parts which can be secured from any of the Ford service stations. The fact that the pinion and gear are not meshing properly causes a misalignment which sets up vibration, producing the humming or singing noise.

Repairing 1911 Reo Differential

Editor THE AUTOMOBILE:—Here is a sketch, Fig. 2, illustrating the way I overcame differential trouble which may interest your readers.

The car is a four-cylinder 1911 Reo. The differential pinions tripped repeatedly, as they were designed too light for hard mountain work in Oregon, an error corrected in the model of the following year.

The remedy consisted in installing six pinions in place of the three originally furnished. This was accomplished by shrinking a band, marked C, of strap iron 1.25 by .375 welded and turned, around the differential gearcase K to furnish sufficient outboard bearing for the three new studs F, carrying the three additional pinions B. The original studs are shown at E, and the original pinions A. The inner ends of all the studs are held by the floating brass spider D.

Five pinions would have doubtless sufficed to do the work, but six were used on account of the convenience of locating and drilling accurately the holes for the new studs. This was done by the use of a drill with an extra long shank, drilling each new hole through the old hole directly opposite across the gear case.

The expedient has proved entirely successful, and might be applied to other cars experiencing similar trouble.

New York City. RALPH ROOT.

Engine Indicator Impossible on Automobile

Editor THE AUTOMOBILE:—Will you give me the rule for finding the thickness of the sides and top of pistons to be made of aluminum? Also for cast iron?

2—Can an indicator be applied to an automobile engine, and if so how?

3—In case it can, will the regular steam engine indicator do?

4—If two engines of the same make and model were set

in the same frame, one ahead of the other, would the rear crankshaft be strong enough to stand the strain?

5—How are the valve settings for high speed engines determined?

Clay Center, Kan. G. L.

—The thickness of the piston is generally a function of the bore, to which is added a small amount to take care of inaccuracies in casting and also for a factor of safety in strength. It is a general rule that, with cast iron pistons, the thickness can be somewhere close to .03 times the bore plus 1-16 inch. This is for a flat-topped piston with an interior boss for the piston pin and of conventional design throughout. Thus for a motor of 3 inches bore, the piston thickness would be .09 plus .06 inch or .15 inch. To get this to our customary forms of measurement, it would be close to 5-32 inch in thickness.

A definite rule for aluminum cannot as yet be laid down as the matter is still in an experimental stage and hence not settled enough for the formulation of empirical formulas.

2—The manograph can be applied by special attachments which are supplied with the instruments.

3—The regular steam engine, or Richardson, type of indicator will not do because it is not capable of operating at the speed customary with gasoline motors.

4—The rear crankshaft would have to be strong enough to transmit the horsepower of both motors. This would be especially true if the timing was so arranged that the power strokes of the two motors were synchronized so that the maximum stress from both motors fell upon the shaft at the same time. In such a case as you mention, a heavier crankshaft should be installed in the rear motor.

5—These are nearly all determined by experiments. What is regarded as a good average timing is first given the motor and then variations are tried until finally the best results are obtained. The design of the manifolds and various features exercise influences which cannot be determined accurately by mathematical calculation.

Use Series Plug for Two Sparks

Editor THE AUTOMOBILE:—The February 18 issue of THE AUTOMOBILE prints a letter from Roy Corbett, page 324, regarding a scheme for operating two spark plugs simultaneously in the same cylinder, from a single-spark magneto. Although, as you point out, the proposed scheme is impracticable, still it is by no means impossible to get the desired results by means of a method, as shown by the sketch, Fig. 3, in which an ordinary spark plug is used in connection with a special type of series plug. There are several makes of these plugs on the market, and I know of a number of instances where they are being used with very satisfactory results.

Again, referring to a letter from J. N. Liolios, page 326, same issue, I am surprised that no one remembers the original Pierce automobile; a single-cylinder machine built on the order of the De Dion-Bouton voiturette, with engine mounted directly on the rear axle. The Pierce motor was very similar to the De Dion motor, having inclosed flywheels, automatic inlet valve, single-piece cylinder and head water-jacketed, etc. It will make a very satisfactory stationary motor for the purpose suggested, if throttled down to run about 800 r.p.m.

Brooklyn, N. Y. JOHN T. MCGUCKEN.

Differential Gears for Front Drive

Editor THE AUTOMOBILE:—Is it necessary to use differential gears on a front drive? According to theory they should be used, but I remember reading an article stating it is not necessary to use them. If they are not needed please give a cross section of the axle used.

Marion, O. D. G. TROWBRIDGE.

—Regardless of whether the drive is taken at the front or rear of the car, there should be some differential mechanism to compensate for the difference in speed between the two opposite wheels. These differences in speed occur not only in rounding curves but in passing over obstructions where one wheel is required to travel over more ground than the other in going the same relative distance. There is practically as much difference between the speeds of the different front wheels as there is between those in the rear under the conditions mentioned. In very light vehicles having narrow tread and where the idea has been to keep the cost of construction down to the lowest limit, the differential has been eliminated, but this could not be accepted as universal or good practice where vehicles are loaded to any extent. When there is no differential it means that one tire is allowed to slip or drag over the ground, putting strains on the construction and wearing the tires.

Chevrolet Cars Geared 4 to 1

Editor THE AUTOMOBILE:—What is the gear ratio of the Chevrolet for 1915?

2—The gear ratio for the Ford?

3—What does S. A. E. rating mean?

4—Is there any difference in the foreign rating and the United States rating?

Lamberton, Minn. A FRIEND.

—The gear ratio of the Chevrolet cars is 4 to 1 for both the Baby Grand and Royal Mail models.

2—The gear ratio of the Ford is 3.63 to 1.

3—S. A. E. rating means the horsepower that is determined by using the S. A. E. formula $\frac{D^2N}{2.5}$ where D equals the bore and N the number of cylinders.

4—The same formula is used quite commonly abroad, although there are other formulas which have standings about as high.

Magneto Cannot Change Storage Battery

Editor THE AUTOMOBILE:—Will you tell me if it is practical to use a storage battery in connection with the magneto on a 1912 Ford? In other words, will the magneto charge the battery?

I want to put on a storage battery so I can use electric side and tail lights. There is no place here where I can get the battery recharged; so I cannot use storage unless I can float it on the magneto.

If this is practical, will you give me a rough pencil diagram showing proper wiring?

2—Can you advise me what I will need in the line of switches, cut-out, etc.?

Sidney, N. Y. J. H. RUSHTON.

—A Ford magneto will not charge your storage battery because it produces an alternating current, whereas, without a rectifying apparatus, a direct current is necessary.

2—This is answered under number 1.

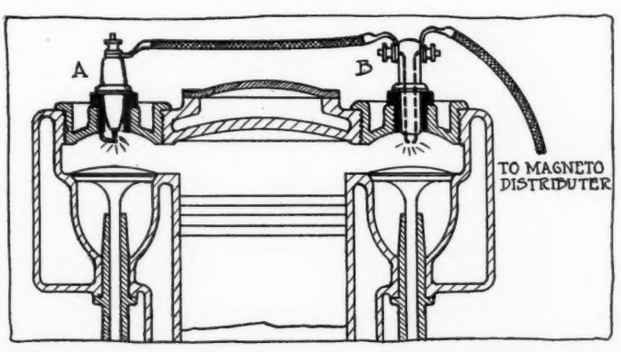
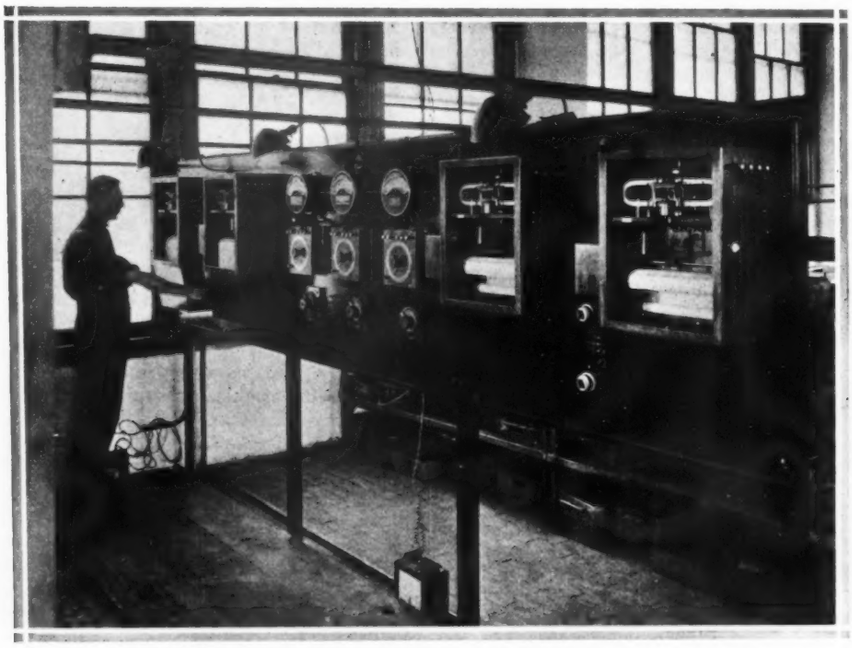


Fig. 3—Method of using a series plug to secure two sparks from a single distributer

Recording Instruments for Heat-Treating

Packard Uses Central Control Station and Colored Lights and Bells Indicate Furnace Temperature—Special Device Keeps Permanent Record of Variations



Control board of heat-treating department. Instruments register the degrees of temperature of the furnaces, and the proper signals to each furnace, whether the heat is high, low or of proper temperature to quench

CONTROL of the heat-treating department in the Packard Motor Car Co.'s plant in Detroit, Mich., is effected by the use of recording instruments which give a permanent record of the rise and fall of the temperatures within the heat-treating furnaces. One of these instruments is connected to each furnace thereby affording the man in control an exact knowledge of the work performed by each of his units.

A Central Switchboard

All the instruments are directly connected to a central switchboard or control station which in the Packard company's plant, is located close to the door entering the office of the governing head of the department. The location of the board in this position has been chosen because it is considered of sufficient importance to be frequently examined by the department head. In installing the switchboard, however, it is of great importance that the location be so selected that the recording instrument itself will be free from any variations caused by excessive external temperature changes.

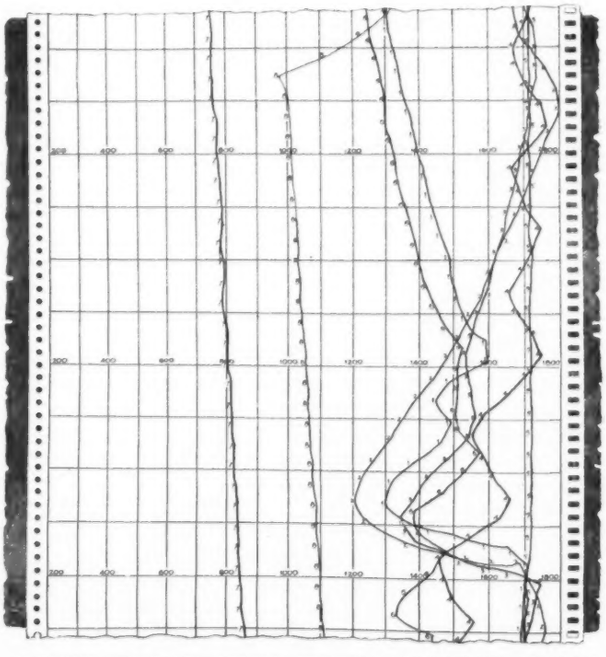
System of Signals

A system of colored lights and bells is used as a signal by the switchboard operator whenever the temperature within one of the furnaces becomes higher or lower than that desired for the particular work being carried on. Besides the signals given in this manner the operator also has the permanent record which is given him in the form of a chart illustrated herewith. This records in degrees Fahrenheit the temperature of the furnace at frequent intervals, thus establishing a continuous curve of temperatures in each of the furnaces. The purpose of the signals is to notify the furnace attendant whether the heat is too high or too low and whether or not it is time to remove the contents of any of the furnaces.

Detail Information

Beside the permanent record of temperatures in each of the furnaces there is also a record of the kind and number of pieces in each. This is kept in tabular form by the same operator who keeps the records of temperature, thus giving a complete permanent notation of exactly the work that each furnace is doing as regards number of pieces taken care of, kind of pieces, temperature at which the heating was carried out and length of time exposed to that temperature.

The recording instrument is of a type which has recently been put out by the Leeds & Northrup Co., Philadelphia, Pa. It is of a type which does not need calibration for resistance, although it is a form which utilizes the resistance at different temperatures to an electric current for the measurement of temperature.



A section of the permanent record of the temperature of a heat-treating furnace in the Packard factory. This records the temperature of the furnace at frequent intervals, thus forming a continuous temperature curve for each furnace

In this style of recording device the lead can be as long as is necessary to carry the information from the interior of the furnace to the simple control board. Another feature is the location of the cold end junction which is situated at the switchboard instead of in the head of the fire end. This is said to do away with the cold end troubles that have bothered users of electrical pyrometers in the past. The variations in temperature of the cold ends are compensated for by a device on the recorder itself which makes it simply a matter of adjustment by the operator, thus making the instrument read direct regardless of any variation of the temperatures of the cold end of the apparatus between 40 and 140 degrees. The same compensation is used on both the indicating potentiometer and the automatic recorder.

Periodical Inspection

In order to keep the instruments at their best effectiveness at all times they are periodically inspected by a man who has been trained by the Packard company to be a specialist in this work. Thus the charts furnished by the recording device are dependable records. In order to distinguish the curve furnished by one furnace from those of the others different color inks are used for each furnace. By the use of contrasting hues a clear record is kept regardless of how closely the temperatures approach each other.

It is only within the last few years that the need for heat-treating equipments of this high degree of accuracy has been appreciated. Not long ago it was thought quite good enough if the error on a theoretical correct temperature was not more than 30 or 40 degrees, but modern alloy steels require much closer working than this if the best is to be got out of them. Practical accuracy within 10 degrees Fahrenheit is possible with the best types of furnace and a reliable pyrometric system. Another advantage of these elaborate heat treating plants is that better work can be done for actually less money, in many instances; for the skill of long trained operators, their appreciation of delicate shades of color and so on, we have substituted registering and recording apparatus.

The possibilities of heat treatment are not yet fully developed since things can be done in metallurgical laboratories that are as yet impossible in a factory, but as knowledge advances we can reasonably expect greater economy in production, because we shall be able to get greater strength from steels of no more complex structure than those in use today. It is in connection with drop forging that accurate heating is likely to make the greatest difference for automobile manufacturers since the greatest variations in strength are now to be found in such parts.

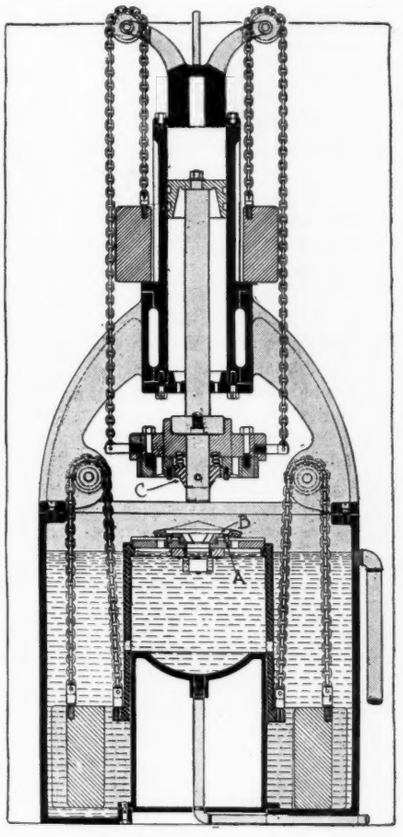
Hardening Bevel Wheels by Special Machine

Elimination of Warping Obtained by Holding Gear Against Die During Quenching

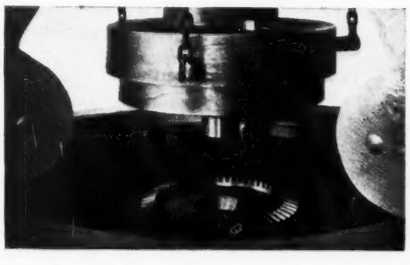
THE principal causes of noise in the operation of bevel gearing are irregularities, due to warping in hardening, either of the teeth as individual units or of the large member of the pair. Of these two causes the second is by far the more important and the machine described here has been designed by the Gleason Works, Rochester, N. Y., in order to prevent any distortion of the crown bevel. The popular system for dealing with bevels has been to copper plate the blank so that the coat of deposited metal is only removed from the actual teeth themselves by the cutting process. This copper sheathing prevents the steel from taking up carbon in the case hardening furnace, so that plunging in the oil bath or in water only hardens the teeth and leaves the body of the gear fairly soft. In this condition the gear can be pressed straight again when it has cooled down, but the operation needs skill and it is not easy to get absolute truth once warping has occurred.

In the Gleason machine the red hot gear is dropped on a die made to suit its shape, and another die is then forced down on top of the gear by air pressure. The two dies with the gear between them are then plunged into the liquid together and the gear is gripped sufficiently to prevent distortion. The process does not really take place in two stages, since it is the weight of the upper die forced down by the air pressure behind it that plunges the whole beneath the liquid, so that it is only a matter of some fraction of a second from the time the hot gear is dropped on the lower die to the time when it is immersed.

In developing the machine it was found necessary to try several different kinds of die, so as to give enough grip and yet allow sufficient piercing of the die plates to give free access of the oil to the gear. In the photograph a gear is shown in place with the upper die just about to descend upon it, and it will be seen that there is a spigot to register with the lower die. This spigot also carries a conical collar shown at C in the drawing, and this expands a split bushing B which rests on the lower die plate A. The expansion of this bushing holds the gear true to center and so squares it up to the dies; which is necessary in order that the conical faces of the dies may grip the toothed part of the gear accurately. The lower die rests upon the head of a cylinder which fits over a stationary head seen at the bottom of the tank, and the dies and gear are carried down till the lower die rests and is pressed upon the top of the head. Oil enters the cylinder by the two holes shown and these are closed directly the cylinder has begun to move, with the effect that all the oil contained in the cylinder is forced to bubble through the dies as the latter descend; so insuring the rapidity and completeness with which the gear is quenched.



Section of Gleason bevel gear hardening machine



Die about to descend upon hot gear

Axle and Frame Movements Plotted for Sharp Single Shock

(The Improvement of Spring Systems—IX)

By M. C. K.

HAVING finished for the present (see sections VI, VII and VIII) with the horizontal shocks, which are the most insidious enemy of those motor vehicles that cannot be equipped with air tires and constitute the principal reason justifying automobile owners and drivers in refusing to have air tires inflated as strongly as their makers recommend, the subject is in the following restricted to the tracing of the effects of the vertical component of a single shock for a vehicle with hard tires.

It will be noticed from Fig. 23 that the movements of the axle and the frame are in themselves unobjectionable, and in fact much less pronounced than those charted for vehicles with air tires, Figs. 9, 10, 11 and 12. To reconcile this observation with the established fact that the air tires nevertheless have a certain indispensable effect for comfort, it is necessary to keep in mind that the chart cannot show the short and disagreeable vibrations which reach the frame as a result of the hard knocks which a running-gear receives if it is not separately cushioned by means of elastic or soft tires —especially when the vehicle springs do not happen to be in the best position for softening such vibrations. But also other inferences are irresistibly drawn, to stand until disproved. One is that it is not so much an active elasticity that is required in the running gears and their tires as the property of deadening vibrations, and another that the vehicle springs could be arranged to take proper care of all vertical shock effects more easily if the active resilient movements within the running-gear were suppressed, and still another, being the one mentioned in the first lines above, namely that the horizontal shocks are the main obstacle to the elimination of resilient movements within the running-gear and must remain so until they are cushioned by resilient movements of the running-gear as a whole. These horizontal shocks are both longitudinal and lateral.

In these provisional inferences there is drawn an outline, in all generality, of the most fundamental improvements of the present spring suspension system which are likely to be worked into practical form in the next ten years. The numerous important refinements for which there is also room, and which at present engage the attention of builders almost exclusively, are in a different class, and with regard to them all mere reasoning, even if it is fortified by a general experience and the study of tests, must remain in the background till experience has been established in each instance—as they deal with highly complicated factors.

The inferences mentioned, almost sweeping as they are in their intended scope, can of course not be even provisionally established by mentioning them or by a single chart, such as Fig. 23, which in all probability could be greatly improved if the subject were taken up by scientists thoroughly versed in kinetics, and which could certainly be made much more convincing by tests with automatic recording apparatus, but they are referred to in advance in this place to indicate the drift of the whole inquiry. The possibility remains that a chart showing the effects of a rapid or peculiar succession of shocks, instead of only a single one, or another chart showing the effects of a different kind of obstacle, may modify or entirely upset the inferences and throw all hope of improvements in the direction of the refinements and accessories—cantilever springs, progressive-resistance springs, spring dampers, regulators and auxiliaries—in which improvements are mostly sought at present.

Two such charts are therefore under preparation and, according to present figuring, should indeed show that the refinements are necessary, though not inconsistent with simplification or the introduction of the more fundamental improvements, especially for commercial vehicles.

Data for Fig. 23

The assumed data according to which the axle and frame movements of Fig. 23 are figured were given in section VI, February 11, as follows: Wheel diameter 40 inches, road obstacle 3 inches high and of triangular cross-section as shown, axle load 800 pounds, unsprung weight 200 pounds, free spring oscillations 90 per minute, flexibility giving 1 inch deflection for 300 pounds pressure, 10 per cent. of friction in spring action, vehicle speed 50 feet per second (35 miles per hour). It is found in course of the figuring that an assumption of a period of oscillation remaining strictly the same for any kind and severity of shock cannot be reconciled with the flexibility and load figures unless much more than 10 per cent. of friction is also assumed, but this error in the assumptions is carried along for the ideas which it suggests and because it does not materially affect the nature of the curves of movement.

The wheels and springs are considered as units instead of pairs.

Figures and Reasoning

For the unsprung weight of 200 pounds there is an unmitigated shock which must amount to one-fifth of the corresponding shock in the case of the 1,000-pound front-end weight of the springless vehicle previously considered. The figure in that case was 3,180 footpounds and therefore becomes in the present instance 636 footpounds, which is spent destructively in wheel, axle and bearings (apart from the much heavier horizontal shock in which we are not for the moment concerned, but which was responsible, for example, for the abandonment of sheet steel front axles). The work of raising the unsprung weight 3 inches, so as to clear the obstacle, is only 50 footpounds.

Next comes the work of compressing the spring. For a 3-inch compression this work should amount to 900 pounds $\times$ 3 inches : $2 = 112.5$ footpounds, according to the formula for spring work, $W = Pd/2$, where P is the pressure and d the deflection caused by it. This formula is not experimental but fundamental, being based on reasoning, but on the other hand it does not recognize spring friction or vehicle conditions which imply that some other incidental and additional work is always done when a vehicle spring is compressed. But, apart from this, the conditions are not quite so simple that a 3-inch compression can be accepted as the right one. The spring is compressed in advance 2 2-3 inches by its load and while being compressed by the shock it can extend upwardly with the load. Another doubt arises, because Kent says (eighth edition, page 260): "Under a load applied suddenly

the momentary elastic distortion is equal to twice that caused by the same load applied gradually." This old rule is unsatisfactory for figuring, as the term "suddenly" is indefinite and might make it appear as if the work of a spring for a given deflection were likewise. The reason for the rule is of course that the work transmitted to the spring by the shock varies with the speed of the shock, and not that the work of the spring for a given deflection varies. The question here is of the amount of kinetic energy or work that must be transmitted to the spring, with its load, when the unsprung weight of 200 pounds is thrown against it in the peculiar manner in which the axle is caused to move, namely in a curve around the road obstacle. It is first of all clear that the amount of the unsprung weight makes no difference so long as it is reinforced by the infinite mass of the rigid obstacle integral with the earth. If it were only 25 pounds it would force the spring upward just as irresistibly.

It is known that the compression movement starts with the vehicle moving at speed of 50 feet per second, which makes the time occupied in scaling the obstacle 0.01755 second, this being the time in which the vehicle passes over 10.53 inches of road, from the moment when the impact is first felt till the top of the obstacle is directly under the axle. A little addition can be made to this time by reason of the retardation caused by the shock. The retardation is less than in the case of the springless vehicle, and the period in question may be taken as 0.018 second. During this time the spring extends with the load while being compressed.

As the natural spring oscillation period is involved with the acceleration of the masses which the spring supports, this extension can be figured without gross error on the following basis: It would be of the same amplitude as the extension which would follow a 3-inch compression, if there were time for it. Such an extension would take the time of one-half of an oscillation period. There are 1 1-2 free oscillations per second, giving 1-3 second to a one-half oscillation. But there is available during the forced compression of 3-inch amplitude only 0.018 second. Instead of extending all the 3 inches with the load, as it would do if the spring were absent, the extension is in about the same proportion to 3 inches as 0.018 holds to 0.33—considering that the spring has a certain inertia against movement offsetting the inertia of the mass of the load. This makes the extension $9 \times 0.018 = 0.162$ inch. The slower the driving, the greater the load lift would be, as period 0.018 would be longer.

On account of this simultaneous extension, the spring requires only to be compressed 3 minus 0.162 inch = 2.838 inches to make the wheel slip over the obstacle. The axle lift remains unchanged. But a load lift of 0.162 is added to the work of compressing the spring 2.838 inches. With the data used, there is little difference between the sum of these two items of work and that required for simply compressing the spring 3 inches, but if the load were smaller, the spring less flexible and the speed smaller the body movement taking place during the compression would evidently become very pronounced, as well understood in practice. As this may be expressed, comparing equal speeds: The greater the load and the greater the flexibility of the springs, the less load lift simultaneously with the impact.

On the chart the load lift of 0.162 inch is indicated. The energy required for it is $800 \times 0.162 = 129.6$ foot-inches = 10.8 footpounds.

Blow of the Wheel

To compress the spring 2.838 inches requires an additional static load of $300 \times 2.838 = 851.4$ pounds. The equivalent in shock of this additional load must be found. As the compression can be effected by gradually increasing the extra load from 0 to 851.4 pounds, making the average weight 851.4 : 2, the work of the shock must be equal to half of that stored in a load of 851.4 pounds that has been raised 2.838 inches, or 0.2365 foot, and this is $851.4 \times 0.2365 = 201.356$ footpounds, half of which is 100.68 footpounds.

The pressure applied to the spring is found by considering the speed of the action. One has $ks = 100.68 = 1/2\ mv^2$. In this case v has an average value determined by the movement of 0.2365 foot in 0.018 second, making it 13.13 feet per second. Hence $100.68 = 1/2\ m \times 13.13^2 = 1/2\ m \times 172.40$, from which m is found to be 1.15.

As the pressure corresponding to a mass, m, of 1.15 is m $\times$ 32 or $1.15 \times 32 = 36.8$ pounds, the blow received by the spring is like that of 36.8 pounds pressure operated at a speed of 13.13 feet per second for 0.018 second, and with an obstacle of the nature here considered, the blow as well as the effect on the spring is sharpest at the beginning of this short period; and this probably makes the load lift greater than figured. That such an average pressure can be applied so suddenly and cease so quickly is due to the peculiarity of the movement of the axle.

If the work were looked upon as the pressure of the 800 pounds of load through a space of 2.838 inches at an average speed of 13.13 feet per second—which is the reverse of the true action, since the load does not come down, but might appear as practically the same at a casual glance—one would have: $ks = 1/2\ mv^2 = \frac{400}{32} \times 172.4 = 2{,}155$, and, with $s =$ 0.2365 foot, k would be found to equal 8,500 pounds. But it is just such exaggerated pressures that are avoided by the use of springs, through the fact that the mass, 800 : 32, is not moved much or rapidly, the spring being moved instead.

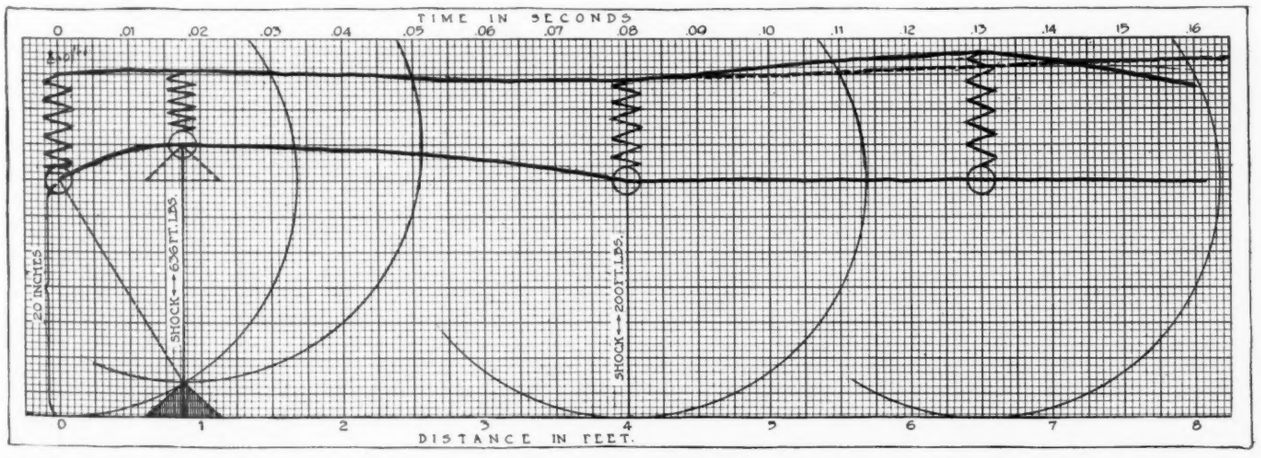


Fig. 23—Curves showing first movements of axle and frame of vehicle with hard tires after one typical kind of shock—plotted in approximate accordance with physical laws

The spring is now compressed 2.838 inches and has accumulated a working capacity of 100.68 footpounds in addition to that of the original load tension, which is now released and capable of producing movement of the running-gear while the latter is off the ground. The vehicle body is raised 0.162 inch above its static level. The axle is 3 inches above its level. The next movement evidently depends considerably upon the shape of the obstacle on the far side—whether it supports the wheel or allows it to drop. The speed of the vehicle has not been much reduced, as the loss in kinetic energy it has suffered from the spring action amounts only to $636 + 50 + 10.8 + 100.68$ footpounds, while the original energy was 117,187.5 footpounds. In comparison with that of the springless vehicle the retardation would be quite insignificant if it were not for the horizontal component of the shock which is not cushioned. As it is, the slight change may be ignored, so as not to interfere with the horizontal scale of the chart. It will be seen that the continuance of a speed close to 50 feet per second precludes the possibility of the wheel hitting the far side of the obstacle when the latter is of triangular section or any similar section.

The spring is under tension between the load above it, 800 pounds, and the axle below it, with its 200 pounds of weight. It will spend the same kinetic energy in the two opposite directions until the wheel strikes the ground. The tension is $800 + 851.4 = 1{,}651.4$ pounds. Out of this tension 10 per cent. is supposed to be lost in friction, leaving 1,486 pounds for work, to operate against the 800-pound load at the rate of 1/2 oscillation in 1/3 second. The deflection from equilibrium is $2.67 + 2.838$ inches $= 5.50$ inches. The energy available, apart from gravitation, is $(1{,}486 : 2) \times (5.50 : 12) = 340.55$ footpounds.

(A variant of the formula $W = Pd : 2$ for the work consumed by or stored in a spring by deflection may be suggested, being more convenient in connection with the majority of the questions which arise. It is $W = Fd^2 : 24$, where F is the number of pounds giving a 1-inch deflection and d the deflection in inches. The result is in footpounds. Allowance for friction loss is to be made additionally according to circumstances).

When in the Air

Any exact construction of the interactions of the spring, extending in both directions at different velocities, with gravitation and forward vehicle speed becomes very lengthy, but a somewhat close approximation can be made as follows:

The axle and the vehicle as a whole would drop 3 inches by gravity in 0.125 second (see table, Fig. 2), and the spring pressure must shorten this period considerably. Now, the first object is to know just when the wheel will strike the ground and with what force, as knowledge on this point discloses the force available for raising the vehicle body to and beyond the height at which the spring is in its initial position.

The whole spring pressure of 1,486 pounds acts in both directions and, unlike gravity, decreases as it is used. If the mean of 1,486 and 0, or 743, is taken as the initial pressure for depressing the axle and this is rounded down to 600 pounds on account of the rapid loss of tension in both directions, the 200-pound weight of the axle may be considered as being practically under the influence of a force 4 times stronger than gravity, and to determine the time in which it reaches the ground, 3 inches below, the gravitation formula $h = 1/2\ gt^2$ can be used, provided the acceleration g is multiplied by four, making the formula $h = 2gt^2$ and $t = \sqrt{\frac{h}{2g}}$ In this case where h is 1/4 foot this means that $t = 1/16$ second. During this period gravitation alone causes a drop of a little less than 1 inch, say 1 inch.

When the wheel strikes the ground, the spring has thus extended 2 inches downward and the whole vehicle has dropped 1 inch. The impact with the ground is, according to $v = gt$ (with $g = 4 \times 32$) that of 200 pounds striking with a velocity of $4 \times 32 \times 1/16 = 8$ feet per second. By formula $h = c^2 : 2g$ (see table, Fig. 2) this is equal to lifting 200 pounds a height $h = 8^2 : 64 = 1$ foot; that is, to 200 footpounds. This is lost in thumping the ground with the hard tire, and the shock is transmitted back to the load without much toning down by the spring, as this is "busy" extending in the same direction as the vibrations travel. The two different molecular actions seem hard to reconcile, though this is purely an unexplained fact.

In the upward direction the spring has meanwhile—during the 1/16 second—extended with the load, raising it one-fourth as much as it moved the 200 pounds of axle weight, or 1/2 inch, and, as the load at the same time has dropped 1 inch by gravity, the frame now stands 1/2 inch lower than at the beginning of the spring extension. At the end of the 1/16 second the spring has altogether extended 2 inches + 1/2 inch and has left only 2.838 inch minus 2.5 inch, in all 0.338 inch to extend before it gets back to its initial tension of 800 pounds, corresponding to the load at rest. The tension is reduced to $300 \times (2.67 + 0.338) = 900$ pounds.

Frame Rebound

To the 900 pounds pressure, in which there is an energy of $Fd^2 : 24 = 300 \times 3^2 : 24 = 112.5$ footpounds comes the energy of the load already moving. It has been raised 1/2 inch in 1/16 second, making the final speed 16 inches per second, giving it an energy of $1/2 \times (800 : 32) \times (4/3)^2 = 100 \times 16 : 72 = 22$ footpounds. The total available is thus $112.5 + 22 = 134.5$ footpounds.

How high will 800 pounds have to be raised to consume this amount of work? Evidently $134.5 : 800 = 0.168$ foot $=$ 2.016 inches. In this figuring the simultaneous gravitation of the load is implied.

The velocity with which the frame is raised 2.016 inches, and the spring extended the same distance, is of course decreasing, but an approximate value may be had from the pressure of 900 pounds equalling 134.5 footpounds. One has

$$134.5 = 1/2 \times (800 : 32) \times v^2 \text{ or } v = \sqrt{\frac{134.5 \times 8}{100}} = \sqrt{\frac{1076}{100}} = 3.27 \text{ feet per second} = 39.24 \text{ inches per second.}$$

In the same proportion it should take only 0.051 second for the spring to extend the 2.016 inches with the load, whereafter the load begins again to descend, as it is 2.016 minus $0.338 = 1.678$ inch beyond its original height. The subsequent oscillations to bring about equilibrium between the load and the spring are of subordinate interest when tires are nearly rigid and no complications with fresh shocks arise.

Fig. 23 shows the wheel, spring and load movements in accordance with the foregoing figuring and with the horizontal scale as well as the vertical one in true proportions and in agreement with time and dimensions. The movements therefore appear much less abrupt than those shown in charts, such as Figs. 9, 10, 11 and 12, where the horizontal scale is greatly reduced. Fig. 23 shows altogether an elapsed time of 0.13 second in three periods, the first being 0.018 second for forced compression, the second 0.0625 second for the beginning of the spring rebound until the wheel touches the ground, and the third 0.051 second for the last portion of the first spring extension.

If the last period had been figured by deducting the first portion of the extension period, 0.0625 second, from the assumed duration of a half period of oscillation, which is 1/3 second and allotting the remainder to the third period, this would have become much longer than 0.051 second, and this is indicated in the chart by the dotted line representing an alternative termination of the frame movement curve. The clash of the two curves is left to indicate a doubt with regard to the period of oscillation, which requires further explanation in the next article.

Double Economy in Power Feed Drill

Time, Labor and Space-Saving Device in Dodge Plant Bores 50 Holes in Cylinder Casting in One Operation—Drills 250 Castings a Day

A MACHINE which has the ability to bore fifty-four holes in a cylinder casting at the same time is now in use in the factory of Dodge Bros., Detroit. This new machine, which is an excellent example of how labor-saving devices have been applied to the manufacture of automobiles, is known as a four-way semi-automatic power feed drill. It is illustrated herewith.

This ingenious machine, which bores more than half a hundred holes in a cylinder casting in one operation, works from four sides of the casting simultaneously. It almost dispenses with the operator as all he has to do is to put the casting in position and remove it when the work has been completed. Fourteen holes are drilled in the top of the casting to take the studs that hold the cylinder head in its place upon the main body of the cylinder. Twenty more are drilled in the base of the main cylinder casting to take the cap-screws that hold the oilpan in position. Eleven holes are bored in the front to hold the timing gearbox housing in position and finally the remaining ten are bored in the rear to take the cap screws that hold the gear cover case and the gearset housing to the cylinder casting.

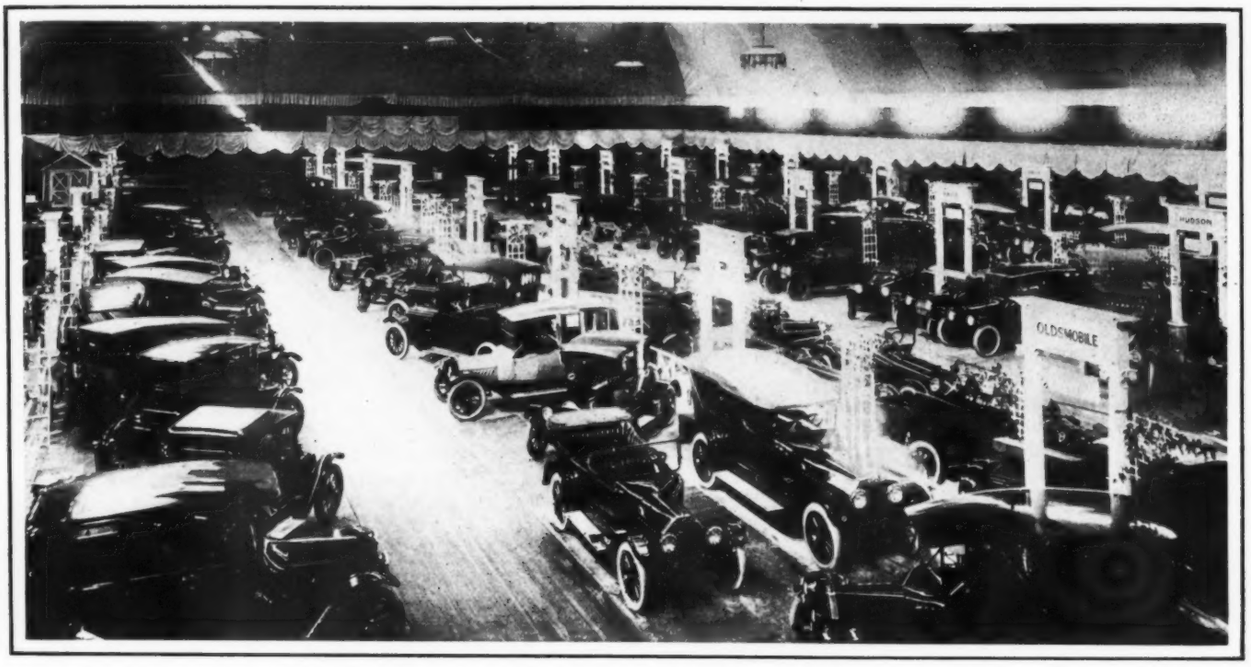
Four-way semi-automatic power feed drill used in the factory of Dodge Bros., Detroit, Mich. This machine works from four sides of the casting simultaneously and almost dispenses with the operator in that the only care required is placing the casting in position and removing it when the work has been completed. In conjunction with this machine is a twin outfit provided with taps instead of drills. This machine cuts the threads in 55 holes in one operation

250 Castings a Day

The machine has a capacity of over 250 cylinder castings in a 10-hour day. Working in conjunction with the machine is a twin outfit that is provided with taps instead of drills. This machine cuts the threads in all the fifty-five holes in one operation. After being cleaned of the chips due to the drilling and capping the cylinder castings can be passed on their way to final inspection and assembly without further delay.

Twofold Economy

This machine not only cuts the time necessary in drilling and capping the cylinder castings to about one-half that needed by even the best machines formerly in use but in addition saves the factory floor-space that would be necessary with a larger number of machines and cuts to a minimum the labor cost in performing this work. The operation of drills or other machines upon all four sides of a piece of material is exceptional and is not only a time-saving element inasmuch as the time used in cutting is just one-fourth that where it is necessary to work on each side separately, but the time necessary in turning over the fixtures or in placing in another machine is saved. Their efficiency renders such machines well worth the additional cost.



View of the Brooklyn automobile show held last week in the Twenty-third Regiment Armory. This was the first Brooklyn show in 2 years

9,000 Cars for Long Island in 1915

Sales of $9,000,000 Predicted—6,000 Cars Sold in This Territory in 1914—Revived Show a Success

AN increase in business on Long Island of 50 per cent. for the present year as compared with 1914 is a conservative estimate if the opinions of the exhibitors at the Brooklyn show can be taken as a barometer. These opinions were, however, based on figures for January and February of this year and last year, and should not be far wrong.

9,000 Cars This Year

This year probably 9,000 cars, valued at $9,000,000, will be called for; last year more than 6,000 cars were sold in this territory, which has an area of 40,000 square miles and a population of over 2,000,000. Some of this new business is due to new cars, such as the Briscoe, Dodge Bros., Remington and Westcott; and also to the increasing popularity of cars introduced last year, as for example, the Chevrolet. Lower prices and more attractive products are also responsible for their share in the increase.

The territory represented by the Brooklyn show is one of the largest and richest in the United States; there are 29,000 cars registered in the four counties on Long Island, or almost as many as New York county, with 31,384 cars. The area of the island is 1,373 square miles and the population is 2,098,460, as against 2,762,522 for Manhattan Island.

The show is considered a success—all the exhibitors are agreed on this point. More cars have been sold, more live prospects obtained, and the crowd on the whole was more alive, more intelligent, and more interested than ever before. No show was held last year, but the great success of this one makes it a certainty that there will be another next year. The attendance was double what it was 2 years ago—largely on account of the reduction of the admission fee to 25 cents and the distribution of invitations, admitting two, to every owner on Long Island.

The Brooklyn show is a retail show and a local show. It is just for the inhabitants of Long Island and is a show at which there are very few sightseers but many prospective buyers. The population is largely urban; approximately 1,900,000 of the population is found in the counties of Kings and Queens wh[ich] comprises Brooklyn, Long Island Cit[y] and a few suburbs. The other two counties, Nassau and Suffolk, have a mixed population. Nassau county especially is noted for its fine estates, and many wealthy people live in this section. Therefore this county is a ver[y] fertile field for the dealer with high-pr[iced] cars, although the tendency is for these people to come straight to New York when they want a car instead of stopping off in Brooklyn.

In addition to this class there is a considerable number of farmers and truck gardeners, who demand cheap and moderate-priced machines. Also there are the townspeople throughout these counties who have grown well-to-do. These people also buy a considerable number of cars. There are only 83,930 people in Nassau county and 96,138 in Suffolk, so that after all the largest automobile trade is found right in the city of Brooklyn itself.

Few Subdealers

This fact and also the comparatively small area of Long Island has resulted in very few subdealers being appointed. All the high-priced cars are sold di[rect]ly through agents in New York or [Br]ooklyn without the use of subagents [in] the smaller towns. The medium and low-priced cars are handled by subdealers to a limited extent, the proportion of dealers for any particular car depending to a [great] extent on the price, the very cheap cars having comparatively many dealers and the medium-priced cars few or perhaps none at all.

While the small size of Long Island and the fact that all but 150,000 of the people live in Brooklyn or its immediate suburbs renders a great number of subdealers unnecessary, many of the exhibitors at the show expressed the opinion that it would be better to have more representatives throughout Long Island, but that it was difficult to place agencies with live men and that no representation was better than poor representation.

Very few contracts for territory were made at the show; most of this work is done later. Just how many new dealers will be appointed this year is problematical, but from a canvass of the show probably the number will be not more than twenty-five.

At present there are forty-five dealers in Brooklyn, which is Kings county, and the population is 1,634,351; ten in Queens county, with a population of 284,041; thirty-six in Nassau, with a population of 83,930, and forty in Suffolk, with 96,138 inhabitants. The dealers in Brooklyn are the main representatives for the whole island, while in the other counties there are subdealers.

Long Island is ideal from the automobilist's standpoint; the country is practically level; the south shore is absolutely so; although there are some short hills along the north shore, the roads are excellent. Besides, there is the Long Island Motor Parkway, which is a private speedway 45 miles in length and on which there is no speed limit.

The attractiveness of Long Island because of its good roads and also its many summer resorts, makes it almost a summer paradise for the motorist, with the result that there is a large transient trade done by the dealers in the small towns throughout the island; most of these motorists come from Brooklyn and New York City.

Good Electric Field

Electric dealers expect a large increase in business in the near future. Brooklyn is an ideal electric city. Its streets are well paved, all the principal ones being asphalted, and it is almost as level as a billiard table. The electric affords the most convenient means of reaching New York.

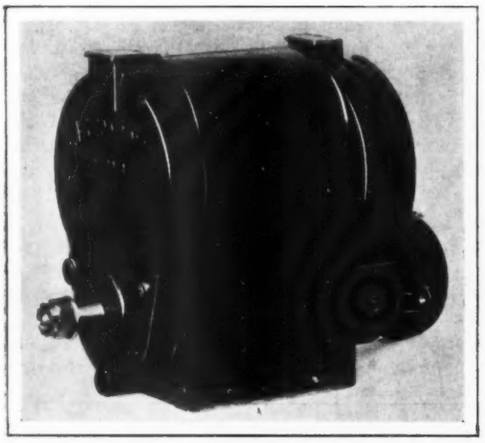
The country surrounding Brooklyn is also very level and the roads are in exceptionally good condition, so that a more ideal district for the operation of these machines could hardly be imagined. To further the popularity of these cars one garage for electrics exclusively has recently been opened and two more are contemplated.

One distributor of high-priced six-cylinder cars looks for a large increase in his business during the coming season, for in addition to the regular business which he has a right to expect he believes that many of the people that had about made up their minds to buy cars last fall or early in the winter will do so some time during the coming year.

He argues that there are a certain number of people that want new cars every 2 or 3 years and that many of these were ready to purchase new ones when the war made them decide to use the old cars for another year. Many of these people, he believes, will be ready to invest in new cars during the coming season.

Eisemann Brings Out Magneto for Sixes

Waverley Electric Truck for Industrial Work



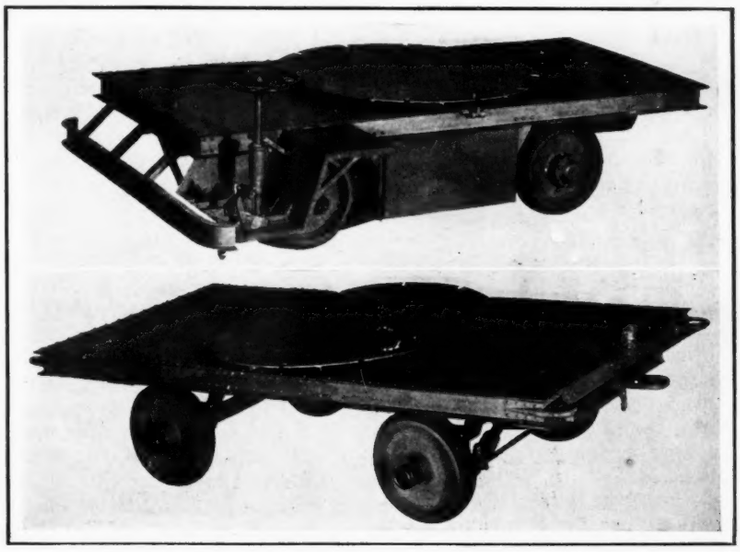
Above—New Eisemann magneto for six-cylinder cars. It is similar in appearance to the Type G four-cylinder instrument recently brought out except that the large driving gear is at the rear instead of at the forward end. On the distributer gear there are two marks; L for left and R for right hand rotation. It is merely necessary to place number 1 piston in firing position and align the mark R or L with a screw in the distributer housing

Right—The newly constructed Waverley electric shop truck which has recently been adopted by the U. S. Government for the Bremerton, Puget Sound, navy yard, is illustrated herewith. It is of structural steel construction, designed entirely for purely industrial purposes. The outfit comprises a tractor and trailer operating on an electric motor which is supplied with current from a thirty-cell, twenty-one-plate lead battery. The turntables are of great use in controlling heavy weights, rendering the tractor and trailer ideal for use in rolling mills and other structural steel work.

NEW YORK CITY, March 9—In addition to the Type G four-cylinder magneto announced in September by the Eisemann Magneto Co., Bush Terminal, a six-cylinder instrument has been put out. In general appearance the new magneto is similar to the four-cylinder design except that the large driving gear wheel is at the rear end instead of at the forward end, thus giving a slightly different appearance to the exterior.

The magnets are covered by sheet steel housing which are pressed into place providing a tongue and groove joint which is absolutely watertight. The distinctive tapered pole piece has been retained, but the winding of the armature has been considerably increased in efficiency. A new feature is the use of oxidized laminations for the core. This prevents eddy currents due to the insulating film of oxide.

One of the features of the new instrument is the simple installation.



Splash Oiling for Eights

A New System to Avoid Use of Drilled Crankshaft

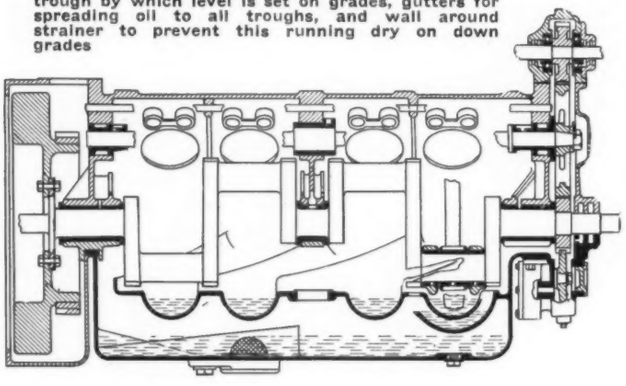


Fig. 1—This shows the overflow beneath the front trough by which level is set on grades, gutters for spreading oil to all troughs, and wall around strainer to prevent this running dry on down grades

ALL the eight-cylinder motors that have so far appeared have been provided with some form of force-feed oiling, the lubricant being directed under pressure through the crankshaft and its throws to the crankpins, and sometimes through the camshaft as well. Naturally such a construction is very expensive, owing to the drilling of the shaft. The splash oiling system, whereby the lower ends of the connecting rods dip into troughs of oil as they revolve, thereby throwing the oil to all the surfaces to be lubricated, is much more simple, but designers of eights have fought shy of it because of the difficulties of splashing the oil into cylinders placed at an angle.

Ernest M. White, automobile engineer of Detroit and specialist on motor car lubrication has come forward with a method of employing splash oiling in eights of the V-type, which makes use of baffles to direct the oil into the cylinders. In combination with these the White eight-cylinder splash systems incorporate the special forms of splash troughs on which Mr. White holds patents and which cause more oil to be splashed on grades than on the level, at the same time having provision for the cutting down of the oil supply when the car is descending a grade: for when going down hill, less work is done by the motor, and consequently less oil is needed. These special forms of splash troughs were described in THE AUTOMOBILE, issue of May 7, 1914.

Though the principle is the same, the White splash system for V eights admits of several modifications it is stated to meet the requirements of any type of engine. The diagrams herewith illustrate the two most important forms which Mr. White has developed.

Method of System

Fig. 1 is a horizontal section of an eight-cylinder fitted with the White troughs, and Fig. 2, the end sections of the same crankcase, showing the corrugated baffle or deflector which is so curved as to throw the oil striking it toward the opposite or right-hand cylinder and placed so as to divide the oil splashed from the troughs into two portions, one for lubricating each set of cylinders. There is, of course, a separate baffle opposite each of the four cylinders of one side.

From the reservoir oil is taken by the pump and discharged into the timing gear case whence it is splashed to the other gears in the timing case by the rapidly-revolving wheel which drives the pump.

From the timing gear case the oil runs to the front or master splash trough and is divided here, part returning directly through a level-maintaining trap to the reservoir. This trap is so designed that when the motor is inclined, as in ascending a grade, a greater quantity is retained, raising the level and causing more oil to be splashed from the trough by the dipper on the connecting-rod. The level is raised about 1-4 inch and lowered about 1-2 inch when the motor is either ascending or descending a 20 per cent. grade.

Effect of Baffles

The baffle plate scheme is readily understood. It is the same idea as if you took a hose and directed its stream of water on a sidewalk, for instance. The water would be thrown upward again at a certain angle to the horizontal. The dipper on the end of the rod splashes or lifts oil from the trough and primarily throws it into left-hand cylinder, Fig. 2, and also against deflector or baffle by which it is redirected into the opposite cylinder. The design of the deflector and dipper is such that practically equal parts of the splashed oil go to each cylinder.

The oil gets to succeeding troughs from the master trough by being directed along passages on the inside of the crankcase. Flowing down the side of the case, it is caught by the inclined gutter and empties into No. 2 trough. By the same means Nos. 3 and 4 are supplied, the oil finally returning to the oil base ready for straining and recirculation.

Special provision is made for supplying the pump with oil when there is little in the reservoir and when the motor is descending a grade as there is a wall around the screen, through which the oil is strained on going back to the pump. This prevents the oil from uncovering this screen and stopping the supply.

A modification of the eight-cylinder splash system just described is shown in detail in Fig. 2. It differs from the other in that the oil is pumped directly into each of the splash troughs, placed one under each of the cranks. Another difference is in the baffles, which are in two sets in this case.

Referring to the diagrams, the oil is taken from the reser-

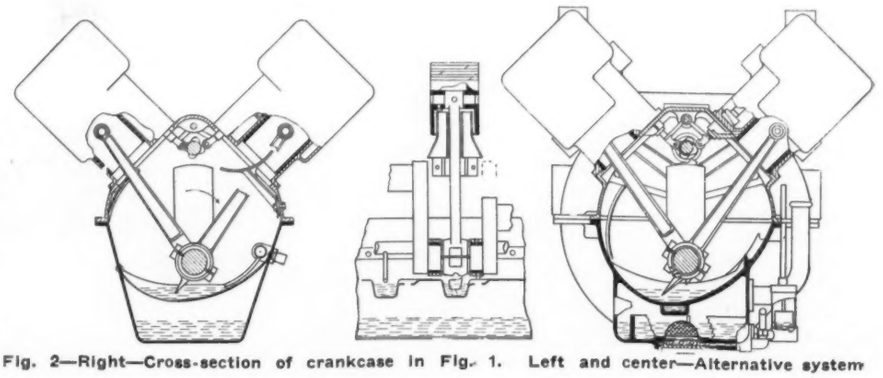


Fig. 2—Right—Cross-section of crankcase in Fig. 1. Left and center—Alternative system

voir by a suitable pump, not shown, and by it fed into a main passage having openings leading to each of the splash troughs. From these, a portion of the oil is thrown by the dippers, part of it going directly into the cylinders, and a portion striking against a baffle from which it is deflected to another baffle and then shot into the cylinder.

At the forward side of each of the splash troughs is an overflow placed below the upper edge, this controlling the depth of oil in the troughs and the quantity of oil splashed therefrom, just as in the other case. When the motor is inclined as in ascending a grade, this overflow point rises, causing a greater quantity of oil to be retained in the troughs so that the dippers will dip deeper and splash more oil to the parts to be lubricated. When descending, the overflows obviously fall, and there is less oil retained, as less is required. In the design shown, the maximum depth of oil would occur when the engine was inclined to a 12 per cent. grade, and on a 25 per cent. grade the depth would be the same as when the motor was in a level position.

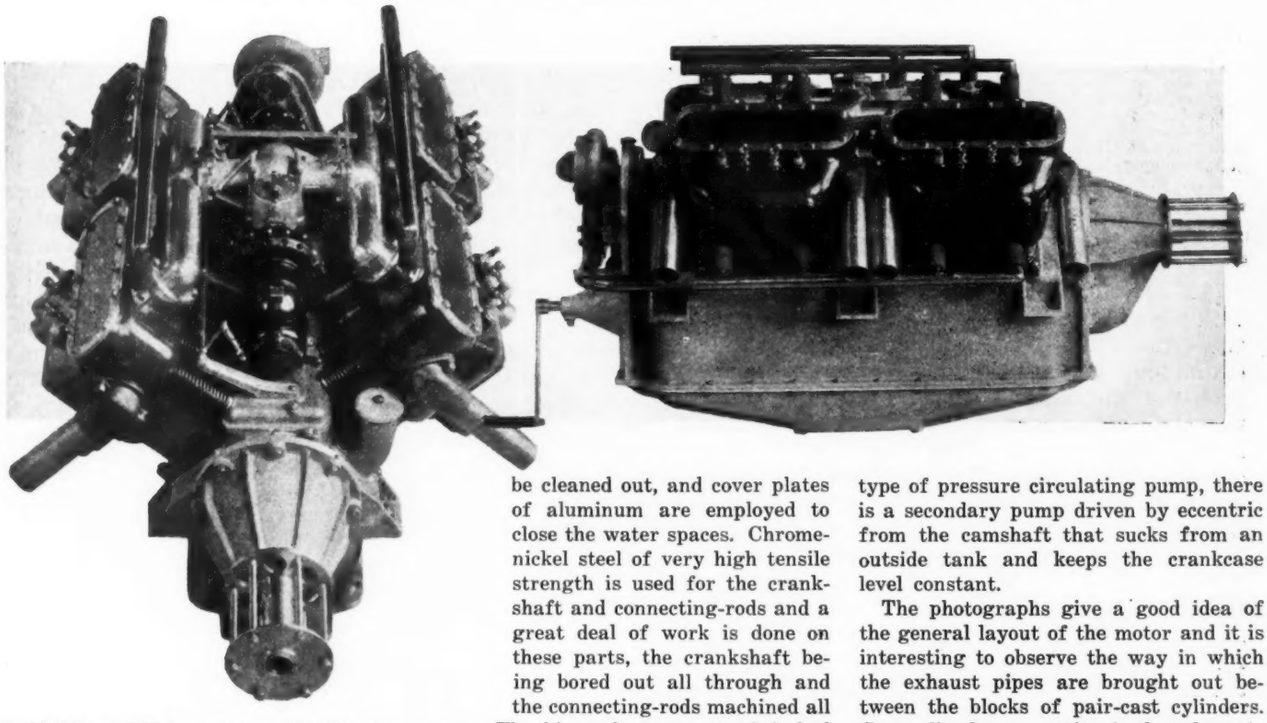
In this system, the size and form of the deflectors or baffles, like the sizes of the connecting-rod dippers and the pump, is largely a matter of experiment, controlled by the size and form of the crankcase. It is understood that the oil thrown from the troughs does not reach the cylinders and bearings in the form of a liquid, but rather as a mist or spray which is beaten into this state by the cranks, connecting-rods and other moving parts within the crankcase.

As in all splash systems, there are oil pockets above the main bearings and oil holes in the lower ends of the connecting-rods so that these parts may receive oil. The special form of compensating troughs which White uses, may also be fitted in combination with the pressure oiling method, that is, in those cases where the oil is fed under pressure to the bearings. So far as the trough design is concerned, these systems are also applicable to vertical fours or sixes.

This system seems to care for every eventuality but, of course, it must not be forgotten that force fed oil is an advantage to any kind of motor when it can be afforded. The higher the pressure at which the oil enters the bearings the greater the durability thereof is a law of mechanics, so that on high-grade cars a forced lubrication system is becoming the rule, however many cylinders the motor may have.

Big Eight for Aeroplanes

New Model Sturtevant Aero Motor Follows Automobile Trend



RATED at 140 horsepower the Sturtevant motor is not really so very large as its cylinder dimensions are only 4-inch bore and 5 1-2-inch stroke, but it is designed to run at the high normal speed of 2,000 revolutions per minute. This is, of course, too fast a speed for a propeller so there is a special geared head for the latter and the reducing gears bring down the rate of revolution to from 1,000 to 1,500.

The cylinders are cast, but the jackets have big openings to allow the cores to be cleaned out, and cover plates of aluminum are employed to close the water spaces. Chrome-nickel steel of very high tensile strength is used for the crankshaft and connecting-rods and a great deal of work is done on these parts, the crankshaft being bored out all through and the connecting-rods machined all over. The big ends are not of forked type but are located side by side on common crankpins and white metal bushings are used at this point. Aluminum is used for the crankcase and within it are cast oil passages to conduct the lubricant to various points. For the main bearings of the crankshaft the supply comes from the cast passages and oil then gets to the big ends through the crankshaft. For cam lubrication the camshaft is drilled out and oil led to its interior just as to the crankshaft, while besides the gear type of pressure circulating pump, there is a secondary pump driven by eccentric from the camshaft that sucks from an outside tank and keeps the crankcase level constant.

The photographs give a good idea of the general layout of the motor and it is interesting to observe the way in which the exhaust pipes are brought out between the blocks of pair-cast cylinders. Generally the suggestion is that the pair casting rather aids accessibility and the motor as a whole is particularly clean.

A quite interesting point in the design, especially in the light of the difficulty automobile engineers have been having with a four-cylinder magneto driven at double normal speed, is the use of two separate Bosch or Mea machines. The branched intake manifold and its enlarged center section at the point of carbureter attachment should also be observed.

The Automobile

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The Boston Show

HAVING more cars, more dealers and practically as great an attendance as any other show in the circuit, the Boston Show must not be underestimated. Here the hundreds of dealers congregate each year to map out a business which totals more than half a hundred million dollars. Here the New England distributor gathers together his cohorts of sub-dealers to make fresh onslaughts against the huge potential buying power of New England industry.

Rich as the New England territory is it has not as yet been tapped to anything like the extent that the future holds out. Millions of dollars are spent every month on automobiles and accessories through the New England territory and the Boston Show is the headquarters of the general staff which organizes the big selling army for this huge campaign. This is a dealers' show organized by dealers, for dealers and patronized not only by the dealers themselves but by an exceptional number of live dealers' prospects.

Men from all parts of the country are here, buying, selling and observing, all fully appreciating the magnitude of the New England market and zealous to still further develop its possibilities. Nor have they been content to take their opportunities at their face value only; in many cases they have analyzed financial and industrial conditions and are able to go after the business systematically.

Markets in Both Hemispheres

SO far the principal customer of the American automobile manufacturer has been his own countryman, and outside North America Europe has taken most of the surplus. At present, with the chief markets of the Old World practically closed there is a strong natural tendency to look to the republics of the South American continent as a field that has not yet been exploited properly. There has been an inclination to leave Argentina and Brazil to the foreign makers who already have a strong hold there in the automobile field, but with Germany prohibited from exportation almost, and great reductions in the quantities of cars that can be exported from France or England, the opportunity for America to seize the market that should be hers by natural right is very tempting.

Recent research by responsible departments of the Government and by representatives of financial interests who are well qualified to judge, shows that business conditions, so far as the ethics of buying and selling are concerned, are improving greatly, in Argentina particularly. It is now quite possible to do business there in a businesslike way, using methods of appreciated value in the parts of the world with which the American manufacturer is already acquainted. To develop the potentialities of South America should not be any more difficult when the job is taken properly in hand than it has been to expand our automobile trade with Australia.

The thing that is not known fully is the type of car which Argentina and the other republics is likely to prefer, for the case is not equivalent to that of Europe, who can take care of herself so far as high-priced chassis go and needs little more from us than the inexpensive vehicles, in the production of which America has stood utterly alone. The thing which really counts is the amount of money the average purchaser desires to spend; for, if a car is sound and well advertised, the details of its design are not of so much importance as the suitability of its price to the market.

In Europe American manufacturers have largely set the fashion in inexpensive cars, and there seems no good reason why they should not do likewise with more costly machines in another continent. All that is needed is really earnest endeavor and persistency of effort, so that a sound trade may be built up in three or four years' time. It is useless to hope to create a big business in a few months, for it is necessary that the public be educated to appreciate the value of American cars of all classes, and it is probable that time and money given to such education will be better spent than it would be on an endeavor to alter our chassis or bodywork radically to suit whatever may happen to be the supposed ideas of the South American buyer at the moment. Fashions in automobile make-up change from time to time and in our sister continent there seems no reason why the direction of change should not be influenced and directed by a little intelligent and patient pioneering which should result in ultimate advantages for both makers and buyers.

London Buses Carry 734,000,000 in 1913

1913 Haulage Nearly Twice as Much as 1910—Of 3,644 Omnibuses Licensed, Only 142 Were Horse-Drawn—28 Motor Buses in 1903—Routes Increased from 195 to 528 Miles

LONDON, ENGLAND, March 6—London omnibuses carried nearly 734,000,000 passengers during the year 1913. This is nearly twice as many as were carried in 1910 and is 90 per cent. as many as were carried by the street cars. It is also nearly 60 per cent. more than were hauled by the local steam railroads. The exact figures for 1910 and 1913, as given in the report of the London traffic branch of the Board of Trade for 1914, recently issued, are:

	1910	1913
Street Cars	763,797,856	811,397,317
Omnibuses	377,207,555	733,931,201
Steam Roads	425,271,861	462,019,537

Of the 3,644 omnibuses licensed in 1913, only 142 were horse-drawn. There were only twenty-eight more buses licensed in 1913 than in 1903, when there were but thirteen motor buses, yet they carried more than two and one-half times as many passengers. At the same time the motor buses serve a much greater mileage than the old horse buses, the length of road traversed having increased from 195 miles in 1912 to 528 miles in June, 1914.

From these figures it will be seen that motor buses have had a tremendous effect in relieving the traffic congestion that would have made the streets impassable if horse-drawn buses had been depended upon to take care of the increased number of passengers. Many bus routes are now from 15 to 20 miles in length.

Although more than 50,000,000 passengers were carried by cabs in 1913, the number of these vehicles was reduced from 11,000 horse-cabs in 1903 to 10,320 cabs in 1913, of which 8,387 were motor driven.

With regard to accidents caused by motor buses, the report says: "In proportion to the work done by these vehicles, their fatal effect has largely decreased. It is not sufficient merely to take the actual number of accidents caused; consideration must also be given to the number of vehicles in each class and the amount of mileage run."

Motor Buses Stopped in Berlin

AMSTERDAM, HOLLAND, March 6—All motor bus traffic on the streets of Berlin, and other German cities has been stopped by order of the Imperial authorities, to conserve the supply of gasoline, according to a message from the German capital.

Since the early days of the war most of the big motor buses have been in service at the two fronts but a few smaller ones and many taxicabs remained and did a good business. Most of them were driven by women chauffeurs.

Last week the Bundesrath adopted a measure by which the number of automobiles in that country not being used for military purposes would be reduced by about one-half. The order issued provided for the licensing of all automobiles, beginning March 15, licenses to be issued only on proof of public necessity. The purpose of this was to save in the consumption of gasoline, lubricant oils and rubber.

To Form Co. for Rittman Process

WASHINGTON, D. C., March 10—A plan is being considered by officials of the United States Bureau of Mines to form a company which will operate under the supervision of the Secretary of the Treasury in connection with the new Rittman processes of manufacturing gasoline and chemicals used in the making of ammunition and dyestuffs. The plan is for oil manufacturers to co-operate in building a plant. Another arrangement discussed is for the Secretary of the Treasury to have sole control of the patents and to license any financially responsible manufacturing company applying to use them.

This method of manufacture which was announced in THE AUTOMOBILE for March 4 consists in vaporizing the residue under heavy pressure and at a temperature of 450 degrees centigrade; the idea being to break up the oil and free the gasoline molecules. The residue that is left by the liquid distilling process becomes available by Dr. Rittman's method and it has been stated that double the amount of gasoline is produced from a given supply of crude. It is stated that full details of the process will be announced by the Department of the Interior, towards the end of March.

LACKAWANNA, N. Y., March 5—The Lackawanna Steel Co., this city, has undertaken the building of a benzol plant, which is now nearing completion. The company has made contracts for the sale of this product for the entire year and expects large sales. The Dominion Steel Co., Sydney, B. C., is also planning to add to its plant and produce benzol.

N. A. C. C. Selects Show and Truck Convention Dates

11,064 Carloads of Automobiles Shipped in February

NEW YORK CITY, March 5—At its quarterly meeting, held yesterday, the National Automobile Chamber of Commerce decided on December 31 as the opening day of the next automobile show at Grand Central Palace. The Chicago exhibition will open January 22, 1916.

Following the report of the Commercial Vehicle Committee, the manufacturers in the chamber selected May 5 and 6 as the dates and Detroit as the place for a convention of commercial vehicle interests, following the regular monthly meeting of the directors, which will also be held at Detroit. To this gathering will be invited all the leading commercial vehicle manufacturers, including those not members of the N. A. C. C.

Evidence that the recent shows at the Grand Central Palace this city and the Coliseum at Chicago broke all records for attendance, and the amount of business done was shown by the report of S. A. Miles, the show manager. There will be a 97 per cent. return of the amount paid for space at the New York show and 83 per cent. on the Chicago exhibition space.

Reports by W. E. Metzger, chairman of the Traffic Committee, show that February shipments of automobiles were 11,064 carloads, a substantial increase over the figures of February, 1914, which were 10,572 carloads.

H. H. Rice, chairman of the Legislative Committee, in his report, stated that forty-eight bills affecting the use of motor cars had been introduced into four state legislatures during the past 3 months. He reported further that there was a general disposition on the part of the lawmakers to recognize the rights of automobilists, and they apparently were disinclined to vote for any measures that would entail a hardship on them.

There were also discussions on reports from the committees on patents, good roads and standard form of warranty.

President Clifton presided at the meeting with more than sixty-five companies represented.

Fred Estey, a Pioneer, Dies in Detroit

CHICAGO, ILL., March 8—Fred L. Estey, known throughout the industry as Pete Estey, automobile editor of the Chicago *Examiner*, died Saturday night in Detroit from pneumonia. At one time Mr. Estey was publicity man for Studebaker and in addition has been identified with motoring for the last 10 years. He was a prominent figure in nearly all the Glidden tours.

SAVANNAH, GA., March 6—The price of gasoline in Savannah has fallen from 14 cents to 11 cents.

U. S. Rubber's Net Profits $9,776,873

$6,945,388 Dividends for Year Upon Preferred and Common Stocks—$10,000,000 Cash on Hand

NEW YORK CITY, March 5—The annual report of the United States Rubber Co., the first since the company changed its fiscal year to correspond with the calendar year, shows net sales of $83,678,812, a reduction of about $10,000,000 from the previous 12 months. This was occasioned, acording to President Colt, by the prevailing low selling price of manufactured goods, the volume of merchandise sold having been somewhat greater than in 1913.

Net profits of the company, before deducting interest charges, amounted to $9,776,873. After deducting interest charges the profits were $7,868,223. Dividends to the minority stockholders in certain subsidiaries amounted to $200,884. Dividends for the year upon the preferred and common stock amounted to $6,945,388, leaving a surplus of profits of $721,950, equivalent to about 2 per cent. upon the common stock additional to the 6 per cent. paid.

President Colt in his report to the stockholders stated that the company's policy has been to keep strong in cash, the item of about $10,000,000 cash on hand representing over 50 per cent. of the company's current liabilities outside of such as would of necessity exist in the transaction of its business.

The company has made an increase of about $4,850,000 over last year, in plants and properties, expending about $2,100,000 in 1914 on the company's rubber plantations in Sumatra, about $870,000 on enlargements of Morgan & Wright tire plant at Detroit, about $355,000 additions to tire and other mechanical plants, about $360,000 additions to footwear plants and about $170,000 additions to reclaiming plants.

—

Garford Motor Truck Co. Starts Work

LIMA, O., March 10—The manufacture of Garford and Garford-Utility trucks has been started by the Garford Motor Truck Co., whose factory is in this city. As announced a few weeks ago, the Geiger-Jones Co., Canton, O., has purchased the motor truck interests of the Willys-Overland Co., which consisted of the manufacture and sale of both the Garford and the Willys-Utility trucks. This entire line henceforth will be manufactured under the Garford name, the Willys-Utility becoming the Garford Utility. The Utility truck has a carrying capacity of 1,500 pounds while the Garford will be built in 1 1-2, 2, 3, 5 and 6-ton sizes.

E. A. Williams, Jr., heads the new company, which has taken over the Lima factory together with all vehicles on hand and the service stations in the eastern states. Mr. Williams was in New York City last week supervising the final arrangements of his New York distributor, the R. E. Taylor Corp., for consolidating under one roof all the Garford company's interests in that territory, now distributed in three places. This consolidation will be in the garage at 427 West 42d street, occupied by the old Gramm company. This company is also in charge of the Boston branch. H. C. Whitney is in charge at Philadelphia.

Other officials in the new company are J. B. Immler of Canton, associated with the Geiger-Jones Co., vice-president and secretary, and A. Stull of Lima, treasurer.

The engineering department of the company has been transferred from Elyria to Lima. Special machinery for building Garford trucks has been installed. The operating force of the Lima plant will be materially increased within the next 2 months. The Elyria plant will henceforth be employed in the manufacture of Overland parts.

—

Overland Ships 302 Cars in 1 Day

TOLEDO, O., March 5—As a strong indication of the upward trend of business conditions in this country, the Willys-Overland Co. points to the shipments which recently have been made at the Toledo factory.

On Monday, March 1, the first day following the biggest month so far experienced by the Overland company, 302 cars, valued at $330,185, were shipped to actual purchasers. This is the largest number of cars that ever left the Overland factory in a single day. Of the total number of cars, eighty-seven, valued at $128,325, were of the Overland six-cylinder model. To carry the one day's shipment of cars, 102 freight cars were required, making a solid train measuring 4,742 feet, or almost a full mile in length.

Although February contained only 24 actual shipping days, the Overland Company's records show a total business exceeding that of last October, which had 27 shipping days and which was previously the company's record month. The increase in average daily shipments was 20 per cent. Shipments for the month were 31 per cent. greater than those of February, 1914, and double those of the same month 2 years ago.

—

Buick Ships 1,952 Cars in Week

DETROIT, MICH., March 9—*Special Telegram*—The week ending February 27 was the biggest in the history of the Buick Motor Co. Shipments totaled 1,952 cars, of which 1,720 were shipped from the factory and the remainder from branches. The total number of Buicks shipped from the beginning of the fiscal year, August 1 to February 27, this year was 30,922, as compared with 21,013 cars for the same period last year.

—

100% Increase in Atwater Kent Business

PHILADELPHIA, PA., March 6—February proved a banner month for the Atwater Kent Mfg. Works, the number of ignition systems shipped being more than 100 per cent. greater than during the same month last year and fourteen times greater than the output of February, 1913.

The present schedule for 1915 deliveries on Atwater Kent ignition equipment calls for 60,000 systems, with a probability of a very heavy further increase.

—

Goodrich Reduces Preferred $2,000,000

NEW YORK CITY, March 10—At the annual meeting of the B. F. Goodrich Co. held in this city today, the stockholders voted to reduce the capital stock of the company from $90,000,000 to $88,000,000, by reducing the 7 per cent. preferred capital stock from $30,000,00, consisting of 300,000 shares at $100 each, to $28,000,000, consisting of 280,000 shares of $100 each. The by-laws of the company call for the retirement of 3 per cent. of the original issue of $30,000,000 each year. This retirement of $2,000,000 to cover a 2-year period means the calling in of $200,000 more than requirements.

The old officers were re-elected as follows: B. G. Work, president; C. B. Raymond, secretary; W. A. Means, treasurer; A. H. Lehman, chief engineer; W. O. Rutherford, sales manager; E. C. Tibbitts, advertising manager; E. C. Shaw, factory superintendent; and Chas. Wolf, purchasing agent.

The number of the directors has been reduced from sixteen to fourteen. Last year's list of directors remains intact with the exception of O. C. Barber and A. H. Lehman, who resigned.

—

YOUNGSTOWN, O., March 5—Stockholders of the Youngstown Sheet & Tube Co. at a special meeting, April 6, will be asked to approve a $5,000,000 increase in the corporation's capital stock, raising the present total of $25,000,000 to $30,000,000. The board of directors has approved this action. Sanction of the stockholders is declared to be already assured.

The stock about to be issued will be preferred, making for the company a total of $10,000,000 of this kind and $20,000,000 of common. Of the latter $18,000,000 is outstanding.

—

NEW YORK CITY, March 10—The Kelly-Springfield Tire Co. has declared the regular quarterly dividends of 1 1-2 per cent. on its first preferred, 1 3-4 per cent. on its second preferred and 1 1-2 per cent. on its common stocks. The preferred dividends are payable April 1 to holders of record March 15 and the common dividend is payable May 1 to holders of record April 15.

—

Firestone Reduces Solid Tires 10 Per Cent.

NEW YORK CITY, March 8—Consumers' discounts are eliminated from a new schedule of Firestone solid truck tire prices which went into effect today. A net price is quoted which is 10 to 15 per cent. lower than any net prices given in previous Firestone lists after deducting discounts.

An advantage in making prices universal and fixed is gained by the abandonment of the old consumers' discount method.

Lower cost of crude rubber, lower production cost, a better

distribution system and a larger volume of sales are the reasons given by E. S. Babcox, advertising manager, for the cut in prices. The new list follows:

Size	Price	Size	Price
36 by 2	$12.60	34 by 5	$40.65
42 by 2 I.H.C. S.W.	14.75	36 by 5	42.95
46 by 2 L.H.C. S.W.	16.00	38 by 5	45.30
32 by 2½	17.05	40 by 5	47.60
36 by 2½	18.95	42 by 5	49.95
38 by 2½ I.H.C. Flange	20.95	34 by 6	49.80
42 by 2½ I.H.C. S.W.	22.95	36 by 6	52.70
32 by 3	20.95	38 by 6	55.60
34 by 3	22.10	40 by 6	58.50
36 by 3	23.30	42 by 6	61.45
38 by 3 I.H.C. Flange	25.65	36 by 7	64.65
32 by 3½	24.55	38 by 7	68.25
34 by 3½	25.95	40 by 7	71.90
36 by 3½	27.35	42 by 7	75.60
38 by 3½	28.80	36 by 8	83.60
40 by 3½	30.20	40 by 8	93.45
34 by 4	33.20	36 by 10	102.15
36 by 4	35.10	40 by 10	114.35
38 by 4	36.95	42 by 10	120.55
40 by 4	38.85	36 by 12	128.90
42 by 4	40.70	40 by 12	144.45
		42 by 12	152.40

United Garage Assn. Formed—Haradon President

ALBANY, N. Y., March 4—The organization of the United Garage Assn., of New York State, Inc., which was tentatively formed in New York City, January 6, was completed March 3 in this city. W. M. Haradon of the Royal Garage, New York City, was again chosen president; the officers are: first vice-president, John Van Benschoten, Poughkeepsie; second vice-president, A. H. Dudley, Rochester; third vice-president, W. D. Whipple, Binghamton; secretary, Harry Waring; treasurer, E. W. Leahy, Albany. Besides these there are twenty directors.

Attorney Melvin Bender, who has been retained by the organization, reported on legislative work in prospect; the measures include a law making it legal to sell gasoline, tires and supplies on Sunday, something not now permitted under the Sunday closing law; a lien law which will give the garageman a lien on a car which has left the garage with a bill unpaid, and a law permitting the arrest of a man who attempts to defraud a taxicab or livery driver.

An emergency $50 credit card will be issued by member garagemen to reputable customers for a small sum, entitling them to a credit of $50 in case of trouble on the road.

Market Reports for the Week

NEW YORK CITY, March 10—Market prices were generally steady this week. Prices in the metal markets were in a few cases irregular. Tin, for instance, rose from $41.50 to $49.50 per 100 pounds, and then dropped to $48.00, with a gain of $6.50. Though copper was steady in prices, there was much irregularity with a stronger tone. Antimony saw gradual rise from $0.18 to $0.19 1-2 while lead rose to $0.02 1-2. Lead is steady but quiet. There were no changes in the oils and lubricants market. The market for crude rubber lacked new features of importance last week. Fine Up-River Para remained at $0.58 throughout the week. The demand for tires and some other lines of rubber goods is reported to have expanded to some extent of late, but manufacturers do not seem disposed to purchase beyond their current needs.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.18	.18	.19	.19½	.19½	.19½	+.01½
Beams & Channels, 100 lbs.	1.26	1.26	1.26	1.26	1.26	1.26	.....
Bessemer Steel, ton	18.00	18.00	18.00	18.00	18.00	18.00	.....
Copper, Elec., lb.	.14⅜	.14⅜	.14½	.14⅜	.14⅜	.14⅜	.....
Copper, Lake, lb.	.14¾	.14¾	.14¾	.14¾	.14⅝	.14⅝	—.00⅛
Cottonseed Oil, bbl.	6.65	6.65	6.80	6.82	6.83	6.75	+.10
Cyanide Potash, lb.	.21	.21	.21	.21	.21	.21	.....
Fish Oil, Menhaden, Brown	.41	.41	.41	.41	.41	.41	.....
Gasoline, Auto, bbl.	.12	.12	.12	.12	.12	.12	.....
Lard Oil, prime	.92	.92	.92	.92	.92	.92	.....
Lead, 100 lbs.	3.92½	3.92½	3.95	3.95	3.95	3.95	+.02½
Linseed Oil	.60	.60	.60	.60	.60	.60	.....
Open-Hearth Steel, ton	18.50	18.50	18.50	18.50	18.50	18.50	.....
Petroleum, bbl., Kans. crude	.40	.40	.40	.40	.40	.40	.....
Petroleum, bbl., Pa., crude	1.50	1.50	1.50	1.50	1.50	1.50	.....
Rapeseed Oil, refined	.75	.75	.75	.75	.75	.75	.....
Rubber, Fine Up-River, Para	.58	.58	.58	.58	.58	.58	.....
Silk, raw, Ital.	..	3.90	..	3.90	3.90	3.85	—.05
Silk, raw, Japan	..	3.40	..	3.30	3.42½	3.35½	—.04½
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	41.50	44.50	49.00	49.00	49.50	48.00	+6.50
Tire Scrap	.05	.05	.05	.05	.05	.05	.....

Automobile Securities Quotations

NEW YORK CITY, March 10—A number of important changes were made in this week's securities market. Some of the changes showed marked gains while others made declines, less marked. Maxwell Motor shares continue to advance, the common 3 1-2 points and the second preferred 1 1-2 points; Firestone Tire common rose 15 points; Goodyear Tire common rose 3 points; Kelly-Springfield common rose 7, its first preferred 1 and its second preferred 2 points; Texas rose 7 1-2 points; U. S. Rubber common rose 2 1-4 and its preferred 2 points and Willys-Overland common rose 3 1-2 and its preferred 1 point. Vacuum Oil dropped 4 points.

In the Detroit Stock Exchange quotations there were few important changes. The Chalmers Motor common dropped 6 1-2 points; Maxwell common rose 4 points, while its first preferred rose 5 1-2 points. In the inactive stocks, the Canadian Ford stock rose 25 points.

	Bid 1914	Asked 1914	Bid 1915	Asked 1915	Net Ch'ges
Ajax-Grieb Rubber Co. com	200	..	250	..	..
Ajax-Grieb Rubber Co. pfd	90	..	100	..	..
Aluminum Castings pfd	91	101	98	100	..
J. I. Case pfd	..	..	76	85	+1
Chalmers Motor Co. com	82	87	..	87	..
Chalmers Motor Co. pfd	92	93½	90	..	—1
Electric Storage Battery Co	..	..	..	..	..
Firestone Tire & Rubber Co. com	288	295	395	400	+15
Firestone Tire & Rubber Co. pfd	108½	109½	108	109½	..
General Motors Co. com	74	75	91½	93	— ½
General Motors Co. pfd	93	93½	94	95½	..
B. F. Goodrich Co. com	22	23	30½	31	—1
B. F. Goodrich Co. pfd	87	90	96	98½	..
Goodyear Tire & Rubber Co. com	230	250	191	193	+3
Goodyear Tire & Rubber Co. pfd	96	97½	103	104½	+1
Gray & Davis, Inc., pfd	90	97	..	..	..
International Motor Co. com	..	5	..	..	..
International Motor Co. pfd	..	15	..	..	..
Kelly-Springfield Tire Co. com	..	..	111	113	+7
Kelly-Springfield Tire Co. 1st pfd	..	..	83	84	+1
Kelly-Springfield Tire Co. 2d pfd	..	..	120	125	+2
Maxwell Motor Co. com	5¼	5¾	27½	29	+3½
Maxwell Motor Co. 1st pfd	27	28	67¼	69	..
Maxwell Motor Co. 2d pfd	9	9½	26½	28	+1½
Miller Rubber Co. com	..	..	163	170	+8
Miller Rubber Co. pfd	..	..	101	103	..
New Departure Mfg. Co. com	..	..	124	125	—1½
New Departure Mfg. Co. pfd	..	..	105	107	— ½
Packard Motor Car Co. com	101	116	..	100	..
Packard Motor Car Co. pfd	96	98½	95	97	..
Peerless Motor Car Co. com	..	30	20	2[illegible]	..
Peerless Motor Car Co. pfd	..	80	..	5[illegible]	..
Portage Rubber Co. com	..	40	34	36	..
Portage Rubber Co. pfd	..	90	85	95	..
*Reo Motor Truck Co	8	8½	11¼	12	+ ½
*Reo Motor Car Co	18	19	27	29	+1
Splitdorf Electric Co. pfd	..	..	..	..	..
Stewart-Warner Speed. Corp. com	56	57	50	52	+2
Stewart-Warner Speed. Corp. pfd	98½	100	101½	..	+ ½
Studebaker Corporation com	23	24	47⅛	48	+2⅛
Studebaker Corporation pfd	79½	81	93	94	..
Swinehart Tire & Rubber Co	70	71	73	75	..
Texas Company	..	..	134	136	+7½
U. S. Rubber Co. com	60	60½	56¼	57	+2¼
U. S. Rubber Co. pfd	101½	102	103	103½	+2
Vacuum Oil Co	..	..	180	183	—4
White Co. pfd	107	110	103	105	..
Willys-Overland Co. com	65	68	98½	100¼	+3½
Willys-Overland Co. pfd	92	96	96½	97	+1

*Par value $10; all others $100 par value.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid 1914	Asked 1914	Bid 1915	Asked 1915	Net Ch'ges
Chalmers Motor Co. com	82	85	..	83½	—6½
Chalmers Motor Co. pfd	92½	94½	91½	93	— ½
General Motors Co. com	75½	77½	90	93	— ½
General Motors Co. pfd	92½	93½	93	96	+1
Maxwell Motor Co. com	5½	6¼	27	29	+4
Maxwell Motor Co. 1st pfd	27	28	67½	69	+5½
Maxwell Motor Co. 2d pfd	9	10	26	27	+1
Packard Motor Car Co. com	101	116	..	97½	—1½
Packard Motor Car Co. pfd	95	98	93½	..	—1½
*Reo Motor Car Co	18¼	19	27½	..	+1½
*Reo Motor Truck Co	8	8½	11½	12	+ ¼
Studebaker Corporation com	..	..	46½	47½	+2
Studebaker Corporation pfd	..	..	92	94½	+ ½
Continental Motor Co. com	..	165	..	190	..
Continental Motor Co. pfd	..	75	80	85	..

INACTIVE STOCKS

Atlas Drop Forge Co	..	21	25	..	..
Ford Motor Co. of Canada	540	560	525	..	+25
Kelsey Wheel Co	190	200	195	..	..
W. K. Pruden Co	..	21	19	20	..
Regal Motor Car Co. pfd	..	50	..	22	..

*Par value $10; all others $100 par value.

NEW YORK CITY, March 5—The Rubber Goods Mfg. Co. has declared the usual quarterly dividends of 1 3-4 per cent. on its preferred stock and 1 per cent. on its common, payable March 15 to stock of record March 10.

The annual meeting of the stockholders of the company will be held in Jersey City on April 8.

Confirm Hess-Bright Ball Bearing Victory

U. S. Circuit Court of Appeals Affirms Decision Holding Conrad Patents Valid and Refuses Petition of F. & S. for Rehearing on an Accounting

PHILADELPHIA, PA., March 8—Affirming the decision of the Philadelphia circuit court of appeals in favor of the Hess-Bright Mfg. Co. handed down last October in its suit against Fichtel & Sachs, and refusing the motion for a rehearing as to the right of an accounting made by the latter, the U. S. circuit court of appeals for the third circuit has issued an order as follows:

"The motion for rehearing has had our joint consideration. The defendant firm was formed but a short time before this suit was brought and is only liable to account for the period subsequent to its formation. Bearing in mind the several prior cases against others in which the rights of the patent here involved were rigorously prosecuted and the not undue time that elapsed between the successful termination of such litigation and the commencement of this suit, we do not find any such delay as should preclude the plaintiff from the customary accounting. The defendant firm volunteered to enter the field of infringement and accounting is a necessary consequence of its act. As to the other matters involved, we see no reason to depart from the conclusion reached and stated in the opinion heretofore filed. The motions are therefore refused."

The suit was brought in 1913 by the Hess-Bright Mfg. Co. of Philadelphia and the Deutsche Waffen und Munitions Fabriken of Germany against Hedwig Fitchel and Ernst Sachs, doing business under the firm name of Fichtel & Sachs, charging infringement of the Conrad patents Nos. 822,723 and 838,303 covering the use of a continuous race in a ball bearing. The patent is owned by the Deutsche Waffen und Munitions Fabriken, the Hess-Bright company being exclusive licensee in America. Judge McPherson in the U. S. district court of Philadelphia handed down a decision in favor of the defendants in December, 1913, but on the appeal the Philadelphia circuit court of appeals reversed this decision and gave the verdict to the Hess-Bright company, holding the Conrad patent covering a continuous race in a ball bearing to be valid and infringed by the F. & S. bearing. Then the F. & S. interests petitioned for a rehearing as to the right of an accounting which has now been denied by the circuit court of appeals for the third circuit.

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Assault May Be Committed with Automobile

JERSEY CITY, N. J., March 8—According to an opinion handed down recently in this city by the New Jersey Supreme Court, a motorist who runs down a person may be indicted for assault and battery. The decision sustains the conviction of Walter Schutte, this city, who was indicted for assault and battery for running into and injuring Thomas Mitchell while driving his car at excessive speed. Justice Garrison, who wrote the opinion, said:

A criminal assault may be committed with an automobile driving along a public street at an excessive rate of speed that endangers the safety of other persons and actually results in such an injury. It requires neither argument nor illustration to show that the excessive rate of speed at which an automobile is driven is a product of the will of its driver and not the result of his mere inattention or negligence. The two cannot be confused any more than the hurling of a baseball bat into a crowd of spectators could be confused with its accidentally slipping from the hand of the batter.

It has been held that responsibility increases with the likelihood of injury, but never the reverse that I am aware of.

—

BOSTON, MASS., March 5—A bill making the present workmen's compensation law mandatory upon every employer in Massachusetts engaged in any industrial line as well as upon the commonwealth, counties, cities, towns and fire and water districts, has been prepared by the Industrial Accident Board and presented to legislative committee on the judiciary. The only exceptions permitted under the bill are domestic servants and farm laborers.

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Driver Must Give Signal to Stop

ST. LOUIS, MO., March 6—The Court of Appeals in a decision this week, defining the motor vehicle law, requiring an automobilist to stop when a driver of horses or mules signals him that his animals are frightened, said a motorist was forced to stop only on signal from the driver himself. In the case under consideration it was argued the teamster had been occupied in trying to stop his unruly steeds and that his father who was sitting beside him gave the warning signal.

Judge Allen held the law could not be construed to mean any more than it says and that if it is nullified by the practical necessities of handling a team, the blame should rest on the law makers and should be remedied by new legislation. A fine imposed by a lower court on the violating motorist who failed to stop on the signal as related above was knocked out.

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TACOMA, WASH., March 4—According to the Washington State legislature private automobile trucks are to be taxed from $10 to $25 a year according to capacity. Trucks for hire would be taxed from $20 to $50 a year, Automobile stages running through the country districts are to be assessed $10 to $25 a year according to capacity.

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Lewis Consolidated Car President

DETROIT, MICH., March 6—A reorganization of the Consolidated Car Co., which took over the business of the Abbott Motor Co., last December, has taken place. C. L. Lewis, secretary and sales manager of the Edward Ford Plate Glass Co., Toledo, O., has been elected president, succeeding Randall A. Palmer. The latter and A. C. Knapp are no longer connected with the Consolidated company. M. J. Hammers, D. E. Perry and F. E. Sangbush, continue with the company respectively as secretary and general manager, purchasing agent and service manager. Mr. Lewis and his associates in Toledo have the controlling interest in the reorganized company.

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Fletcher Heads Remy Electric Co.

INDIANAPOLIS, IND., March 6—On March 1 the annual meeting of the Remy Electric Co., Anderson, Ind., was held in Indianapolis, where most of the officers of the company reside. Officers were elected as follows: President, S. A. Fletcher; vice-president, Hervey Bates, Jr.; secretary-treasurer and general manager, H. W. Griffith and assistant to the president, J. C. Woods. The officers and Theodore Stempfel compose the board of directors.

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Timken Buys Metal Products Plant

DETROIT, MICH., March 6—The Timken-Detroit Axle Co. has purchased the plant, buildings and machinery of the Metal Products Co., automobile axle manufacturers. This does not mean, however, that they have purchased the name, good will, etc.

The increasing business of the Timken company made it necessary to enlarge. It was found more advisable to acquire a plant already fully equipped with the needed machinery and equipment rather than to wait until an addition to the plant is completed, as this would have meant a delay of several months before production could have been increased.

The new property will be known as the Timken-Detroit

Metal Products plant and will be operated to its full capacity. Six hundred men are employed in the new Timken acquisition.

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BOSTON, MASS., March 10—A. S. Holly, for several years with Alvin T. Fuller as manager of the truck department of the Packard in this city, has severed his connection with that company to assume the management of the J. C. Tucker Co., distributor for Chase trucks in that territory. B. E. Blackley will manage the Tucker agency in Providence, R. I.

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INDIANAPOLIS, IND., March 4—The officers of the Marion Motor Car Co. have made preparations to move their effects to Jackson, Mich., where the parts of Marion cars are being made by the Mutual Motors Co. The moving of the general offices together with the three main officers, J. I. Handley, Guy Monihan and Thomas Marshall, is made so as to bring the management close to the place of manufacture.

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Guy Lewin Takes Dodge Agency for London

NEW YORK CITY, March 8—Guy Lewin, head of Guy Lewin, Ltd., London, has received the Dodge Bros. agency for London. Mr. Lewin will make permanent quarters in Detroit, Mich., where he will carry on all business in the interests of the London concern. Confident of his ability to do a good business in England with American cars and accessories, especially in cars selling under $1,000, Mr. Lewin paid a visit to this country last month in quest of automobile agencies, his immediate object. The Dodge Bros. agency is the first one to be taken.

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INDIANAPOLIS, IND., March 8—At the annual election of the Indianapolis Chamber of Commerce a few days ago, F. I. Willis was elected president for the ensuing year. Mr. Willis is one of the most active men of the younger element in the automobile industry and is vice-president and manager of the Hearsey-Willis Co. He has always been active in the affairs of the Indianapolis Automobile Trade Assn. During the past year he was vice-president and chairman of the executive committee of the Indianapolis Chamber of Commerce.

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ST. LOUIS, MO., March 5—The St. Louis Automobile Manufacturers' and Dealers' Assn. has decided to issue a price current of used automobiles in this city. Each dealer is to use a special blank on which will be the price which each used car he has sold has brought. The reports are to be inclosed in an envelope bearing the key number of the dealer making the report. When the secretary of the club receives the report he is to check the name of the dealer on his record. A committee will then digest the reports and send the price current to the members. This is the plan followed in Chicago.

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INDIANAPOLIS, IND., March 8—P. K. Morrison, of Muncie, Ind., has been appointed receiver for the B. T. K. Gear and Engine Co., of that city. This action was taken in the Federal court in this city on a petition filed by creditors alleging the concern owes more than $50,000 and asking that it be adjudged bankrupt.

Suit has been brought in the county courts by Martin Bright asking that a receiver be appointed for the Bright Carbureter Co., of this city. Mr. Bright alleges the company is insolvent and is in debt to him to the amount of $259.

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Hand Klaxonet Sells for $4

NEW YORK CITY, March 9—The Lovell-McConnell Mfg. Co., Newark, N. J., manufacturer of the Klaxon, announces a new hand signal, called the Hand Klaxonet, which retails at $4.

The horn operates on an entirely novel principle. The plunger projects from the back instead of from the top. It operates at the slightest touch. The same permanent guarantee that goes with the other Klaxon horns is carried by the new one.

The new Hand Klaxonet, which sells for $4

Hanlon Patent Valid

Court Sustains Claim Against Rauch & Lang Carriage Co. and N. A. C. C. as Co-Defendant

CLEVELAND, O., March 9—*Special Telegram*—In sustaining the complaint of William D. Hanlon against the Rauch & Lang Carriage Co. and the National Automobile Chamber of Commerce as co-defendant, charging infringement of a windshield patent, Judge John H. Clarke granted an injunction and passed the case on for an estimate of damages.

"Infringement is claimed in the reissued patent No. 13,653," Judge Clarke's opinion reads, "for the patented device of the independent glass rain panel, hinged at the upper edge and mounted in front of the windshield. The problem which Mr. Hanlon undertook to solve is really an important one of providing a clear view for the driver for a fast moving motor car. The only question the Court thinks important is whether the claims of the patent involve the degree of novelty which the law requires."

The evidence shows a painstaking search concerning prior construction and results in the counsel for the defendant placing reliance in the argument for a prior state of art, claiming Hanlon made no discovery on Faulkner's British patent in 1908 and on the Didier French patent in 1906. "It is obvious from the descriptions that these patents did not wholly solve the problems Mr. Hanlon undertook. Clearly Hanlon was the first to conceive the construction, accomplished his aim, and I cannot doubt that it shows the ingenuity and value intended to be rewarded by the patent law. I therefore conclude that the patent is valid and the plaintiff entitled to the relief requested."

It is pointed out that where the visor of the windshield is made stationary no infringement exists.

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Lozier Trustee Issues Statement to Creditors

DETROIT, MICH., March 8—Terms of the sale of the Lozier Motor Co., were announced today by the Detroit Trust Company, trustee.

The Associated Lozier Purchasers, which recently bought the property at auction with a bid of $1,000,000, are to pay $200,000 in cash and file a surety bond in the penal sum of $150,000. Periodical payments must extend over a period of 1 year from the date of confirmation of sale, Feb. 15, 1915. The purchasers have the right to relinquish to the estate the Detroit real estate, which includes the plant and permanent fixtures and receive credit. A dividend of probably 5 per cent. is to be paid to all creditors as soon as claims are filed and approved.

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Receiver Named for Speedwell

DAYTON, O., March 9—Acting on the application of the Dayton Savings and Trust Co., as trustee of the bondholders, Judge U. S. Martin, of the Common Pleas Court, on March 1, appointed Carl R. Green, mechanical engineer, receiver for the Speedwell Motor Car Co., under a bond of $10,000.

Though the allegation is made in the petition that the company is in danger of insolvency, the proceedings are based on the charge of breach of conditions upon which the mortgaged bonds were executed. The bonds, totaling $150,000, represent the bonded indebtedness on the plant, which is located in Edgemont, and twenty-three city lots which are part of the company's assets, and all of the tools, fixtures, appliances, etc., exclusive of the accounts receivable.

C. D. Heald, chairman of the creditors' committee, which has been working on a proposition which it was expected would bring the company out of its financial troubles, expressed surprise over the action taken in court. The committee had proposed to the bondholders that they take up the merchandise claims against the company, amounting to $60,000.

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Century Rubber Co. Is Bankrupt

TRENTON, N. J., March 10—The Century Rubber Co., Plainfield, N. J., has filed a petition in bankruptcy, in the United States Court. F. B. McDermott, of Jersey City, has been named receiver by Judge Haight. The papers set forth that the authorized capital of the company is $3,500,000, assets of about $200,000 and liabilities of $37,000, but that the cash of the concern has been reduced to $400.

A 500-Mile Race for Detroit

Speedway Club to Hold Meet Labor Day—Work Started on 2.5-Mile Concrete Speedway

DETROIT, MICH., March 9—*Special Telegram*—The Detroit speedway project is assured to automobile racing enthusiasts. The speedway is to be inaugurated next Labor Day when a 500-mile race will be held. W. E. Metzger returned from New York City with permission from the American Automobile Assn. to hold the race on that date. Indianapolis capital has interested itself in the venture, which has brought about the organization of the Detroit Speedway Club with practically the elimination of the entire former officers and promoters. The new organization includes prominent figures in the industry and is known as the Detroit Motor Speedway.

Actual work on the construction of the speedway was started today by the contractors, J. M. McCarthy & Co. and S. D. Maddux, of Indianapolis, and by the end of this week all the necessary machinery will be on the ground and a large force put to work, as the contract calls for the completion of the race course by August 1.

The speedway will be located about 10 miles from the city along the Detroit, Monroe and Toledo railroad and also the interurban road. It will be 2 1-2 miles long and made of concrete. The curves will be so constructed that racing cars will be able to take them at full speed instead of slowing down. The grand stands will have seating capacity for 75,000 people. Special boxes and other spaces will be erected to permit a total attendance of 150,000.

The cost of the speedway is estimated at $475,000. The land, which covers about 350 acres, cost about $150,000.

Toledo To Have 2.25-Mile Speedway

TOLEDO, O., March 5—The Toledo Motor Speedway Co. has been incorporated with a capital stock of $10,000, which is merely a nominal capitalization, and which is to be increased later. The incorporators are: A. T. Atwood, of the Atwood Auto Co.; J. Edmund Pierce, New York; Paul T. Gaynor and John O'Leary, attorneys; Edward H. Rockberger. The object of the promoters is to build a speedway 2.25 miles long, modeled after the Indianapolis speedway. Within the main track there is to be a 1-mile speedway for horse races and also a mile track for automobile races. It is claimed that an option on a property has been obtained.

COLUMBUS, O., March 9—Preliminary arrangements are being made by the Columbus Automobile Club for a 2-days race meeting to be held in May, previous to the Indianapolis races, which is expected to attract the best known drivers of the country. The meeting will be held either May 15 and 16 or May 22 and 23 at the Columbus Driving Park. It is planned to hold either a 100-mile or a 200-mile race on the second day of the event. C. C. Janes, chairman of the contest board, has taken up the work of securing about fifteen of the best drivers to participate. The remainder of the program will be made up of shorter distances.

19 Entries for Venice Grand Prix

VENICE, CAL., March 4—The entries for the Venice Grand Prix, to be held on the Venice Parkway, March 17, now number nineteen and represent the automobile racing élite of the country. Entries will be received until noon, March 11. The race management predicts a list of twenty-five cars before the lists close.

The entries made to date include three Maxwells with Barney Oldfield, Eddie Rickenbacher and Billy Carlson nominated. Earl Cooper has entered two Stutz machines. The 1913 American road champion will drive his No. 8 and Dave Lewis is to drive his other car.

George R. Bentel of the Pacific Coast Simplex and Mercer agency wired the entry of Louis Disbrow's new Simplex from San Francisco this afternoon and the Mercer trio together with Bentel's Californian are expected as soon as the team returns from San Francisco, where the four cars are entered in the Vanderbilt Cup race.

The Hercules Special, which is also to appear in the 500-mile Indianapolis race with Harold Hall at the wheel, has also been signed up.

Two Chevrolet cars are entered with Jack Lecain and R. C. Durant nominated as drivers. J. Alex Sloan wired a Case entry yesterday and named Eddie Hearne as the probable driver, but it is claimed here by friends of Bob Burman that he has the option of one of the Case cars for the beach city race March 17.

Orville Jones has entered an English Napier and named himself as the driver. J. P. Yates has entered a Neiswender Special and nominated A. A. Cadwell, the former Marmon driver, as the pilot. W. H. Jones has entered the Simplex formerly owned by George Settle. This car is to be driven by Bill Aldridge, one of the greatest amateur drivers in Southern California, who has just turned professional.

A Chalmers and an unknown car entered by wire from San Francisco today by a W. A. A. representative, will be seen.

The Bugatti driven by J. B. Marquis in the San Francisco races has been entered by C. W. Fuller of New York.

Among the entries promised are the Ono, which won third place in the Grand Prix with Hughey Hughes at the wheel; The Parsons Special, entered and driven by Jim Parsons; the King, owned and driven by Arthur Klein; the Gordon Special, which won fifth place at Corona and the two Edwards Specials from San Francisco.

While the postponement worked a hardship upon the Venice race inasmuch as it did not give the drivers a chance to prepare for the faster course in time to be ready for the opening practice at Venice, March 7, it created a great interest in the beach city's Grand Prix, as many of the cars which appeared in the Northern California races did not get a chance to show their speed on account of the course.

A crew of 100 laborers has been at work on the Venice course for the past week, banking the curves to an elevation of 6 feet at the outer edges. Asphaltum is being used on the inside of each curve with lumber on the elevations. While the course is naturally fast, the banked turns give the critics cause to believe that a record will be made which will be in the same class with the mark established by Eddie Pullen with the Mercer at Corona on Thanksgiving Day.

Indianapolis Spring Opening in Full Swing

INDIANAPOLIS, IND., March 8—Under the auspices of the Indianapolis Automobile Trade Assn., the spring opening of automobile and accessory dealers began today and will continue throughout the week. Weather conditions today are ideal and if it continues, there should be a record-breaking attendance.

Each concern is exhibiting in its own place of business, and the decorations in many instances are elaborate. The Gibson Co., for instance, has its sales room decorated to represent a Japanese garden. The down town sales room of the Nordyke & Marmon Co., in addition to being decorated, has an orchestra which will give daily concerts.

There are some sixty different concerns exhibiting. These are showing forty-six makes of gasoline and five makes of electric pleasure cars, twelve makes of trucks and all of the various kinds of accessories.

Dealers and buyers are expected here from all parts of the state, as Indianapolis is the distributing center for Indiana. Many dealers' contracts doubtless will be closed during the week. A number of sales are expected.

A special feature of the week will be the visit of business men to the new assembling plant of the Ford Motor Co. in East Washington street tomorrow afternoon. The plant, a four-story fireproof structure containing 200,000 square feet of space, recently has been completed and placed in operation. The plant expects to assemble 8,300 cars by July 1.

The company will provide 350 Ford cars which will participate in a parade through the down town streets, business men riding in the cars. They will then go to the plant for a trip through it. There will be speeches by Mayor Joseph E. Bell and others. The trip has been arranged by the Indianapolis Chamber of Commerce, who have invited other commercial and civic bodies to join in the demonstration of welcome to the new plant.

Jitney Line Gives 6 Rides for a Quarter

HOUSTON, TEX., March 5—Jitney lines in this city are offering reduced fares. On the Montgomery line there are ten cars called coupon cars, which are to give six rides for a quarter. A sign on the windshield will warn passengers that the cars are coupon cars, which means that with every fare paid a coupon will be given. Five coupons can be exchanged for one ride.

Jitney War On in Tucson

TUCSON, ARIZ., March 5—War is on between the drivers of Tucson jitney cars and the Federal Power & Traction Co.,

which controls the local street railway system. All Tucson has taken sides. Public sentiment is overwhelmingly in favor of the jitneys.

The most sensational development of the fight was the capture of the midnight car which runs to the University of Arizona. Seventy students chased away the conductor and motorman and with two automobiles towed the car off the track and through the gate onto the campus. No other damage was done the car.

At the instigation of the traction company, several jitney drivers have been arrested, charged with violating the traffic ordinance. Most of the cases have been disposed of, the drivers being dismissed.

E. N. Sanderson, president of the company, has filed with the city commission a petition praying for the regulation of the jitney buses. He claims that his concern has taken in about $1,000 less than operating expenses since the introduction of five-cent autos last August.

Sanderson's petition asks that the jitneys be required to furnish bond for damages to persons injured in accidents; that they be required to traverse the whole length of any street car line they now parallel in part; that they be compelled to operate on regular schedule and pay a reasonable license fee for the use of the streets.

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PORTLAND, ME., March 8—The Jitney Transportation Co. has been granted a certificate of organization to engage in all kinds of transportation by means of automobiles in this city, with a capital stock of $50,000. P. F. Morse is the president.

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LOS ANGELES, CAL., March 2—The Los Angeles jitney bus ordinance, which has been hanging fire for several weeks, has been approved by the city council. The ordinance obliges drivers to post an indemnity bond of $5,000 to protect passengers in case of accident. Persons of any nationality or race must be accepted as passengers. The Auto Bus Drivers Assn. made a hard fight on this point, but the council declared that the jitney bus, as a public utility, could make no discrimination against negroes and Chinese.

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INDIANAPOLIS, IND., March 5—A bill introduced in the Indiana legislature at the eleventh hour, regulating jitney buses, has been killed. Charges were made that the bill was backed by street railroad companies of the state. It provided that jitney buses should be regulated by the Indiana State Public Service Commission. A bill authorizing the formation of motor car mutual insurance companies also has been killed.

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ANN ARBOR, MICH., March 6—The University of Michigan's first short course in highway engineering has been opened with prospects of an average attendance of at least 100 for the semester.

329 Cars and Trucks at Boston Show

(*Continued from page* 444)

ing for $765 incorporating an L-head block 3.25 by 4 5 Perkins motor, Atwater Kent ignition, Disco lighting and starting, a cone clutch, three-speed gearbox mounted on a 106-inch wheelbase with 30 by 3.5-inch tires. It is shown in stripped chassis form and is a good example of low-priced car design.

The National exhibit stands out from the general background rather prominently through the use of a garden-like lattice fence with flowers draped upon it. This surrounds one of the new four-seated boatline bodies. A violet-colored roadster also renders the exhibit distinctive and is an example of the use of unusual shades. Throughout the entire exhibit space will be found examples of this color-display feature. Jackson has a violet touring body with a black hood and black running gear that is an example of contrasting hues on the same car.

Cole is showing a gray car with red wheels, Mercer has a touring car with a dull oil-finish black that appears to be a durable finish for cross-country work. Maxwell is exhibiting a canary-colored roadster with black trimming, a light gray touring car and a cream-colored stripped chassis. Locomobile has a distinctive maroon touring car. Peerless has a town car of café-au-lait shade, with basket-work sides. Winton has a touring car with a cream-colored body finished with a black line around the top of the side and upholstered in green. Another attractive Winton exhibit is a slate-colored touring job. White has a light gray convertible and a touring car having an aluminum finish with black running gear. The Lenox, which is only exhibited at the Boston show, is in the form of a bright red roadster with a polished brass radiator and wire wheels.

The Buick exhibit is another that is distinctive. Separated from the remainder of the exhibit space by a low, brass railed fence is a white roadster which contrasts strongly with the dark background against which it is mounted.

These distinctive color schemes, in spite of their wide variety, harmonize well with the general background of decorative effect. Boston has always boasted of the art displayed in the handling of the show and this year the scenic artists have outdone themselves.

Grecian Decoration Scheme

The scheme of decoration is based on southern Greece in the spring. Entering Mechanics' Building by way of exhibition hall one passes through a Grecian grove formed by more than 100 trees with their branches intertwined. Greek oleanders, azaleas and hedges in combination with the lighting effect produced by thousands of vari-colored electric lamps give a harmonious scheme which in no way conflicts or subdues the exhibits themselves. Grand hall has been made to represent a Grecian court. At the stage end there is a Grecian view shown through the facade of a Greek temple. The rear wall carries a mural painting of the Acropolis. The signs are in glass on white marble pillars. At the intersection of the aisles in Grand Hall there is a temple with its gilded dome studded and surrounded by hundreds of lamps.

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Bodies the Feature of Truck Exhibits at Boston

(*Continued from page* 445)

light weight. In this connection it must be understood that the average panel body, constructed more for appearance than utility, is seldom loaded to anything like capacity because of the light weight of the packages and the limited capacity of such bodies.

The body is of unusual width, and equipped with two longitudinal shelves within, providing the maximum carrying space without superimposing packages one upon the other. On the outside, along each side are racks for the accommodation of lengths of matting, carpet and the like. At the front is a seat of unusual width, designed to accommodate the extra helpers often carried to expedite delivery. The entire front of the load-carrying portion is open, permitting the packages to be unloaded from the front.

Another interesting feature of the White exhibit, not in the nature of a body, is the 5-ton six-cylinder tractor-truck. This vehicle is equipped with 48-inch steel wheels in the rear with 12-inch flat steel tires, fitted with removable cone-shaped studs for traction in soft ground. The front wheels are also of steel, 40 inches in diameter and ribbed for steering purchase in loose turf. It is equipped with a standard White steel dumping body.

Other vehicles on exhibit are the Buick, Chase, Garford, G. V. electric and gasoline, I. H. C., Kelly, Kisselkar, Koehler, Lippard-Stewart, Locomobile, Mais, Mack, Milburn electric, Netco, Overland, Pierce-Arrow, Republic, Rowe, Service, Stanley, Stewart, Trumbull, Vim and a Winton.

Factory Miscellany

CONNECTICUT Telephone Adding—The Connecticut Telephone & Electric Co., Meriden, Conn., is adding two stories on one of its present three-story buildings. This will make a building 50 by 100, five stories in height. The past year was the best the company has ever experienced, and up to March 1, 1915, the volume of orders for ignition apparatus alone aggregates more than for any previous year's entire business.

Radiator Co. to Add—The Harrison Mfg. Co., Lockport, N. Y., manufacturer of automobile radiators, will build a $15,000 addition.

Airplex to Move—The Airplex Inner Tire Co., 3147 Locust street, St. Louis, will move its plant to Springfield, Mo., and will increase its equipment.

Newark Body Co.'s New Plant—John Colyer & Co., Newark, N. J., manufacturer of carriages and automobile bodies, will build a factory on Halsey street.

Swinehart Adding—The Swinehart Rubber & Tire Co., Akron, Ohio, is having plans prepared for a three-story reinforced concrete and brick factory addition, 60 by 130 feet.

To Make Portable Garages—C. W. Mower, Spokane, Wash., is planning the erection of a factory at Los Angeles, Cal., for the construction of portable garage and beach houses, to cost $40,000.

Auto Heater's Toronto Factory—A factory for the manufacture of automobile and carriage heaters is to be equipped by the Auto Heater Co. Ltd., Toronto, Ont., which was recently incorporated with capital stock of $150,000.

Rome Co. Mfg. Trucks—W. M. McCormick and M. C. Broach, Rome, Ga., have organized a company with a capital stock of $15,000, to be known as the American Municipal Motor Co. and will erect a plant for the manufacture of motor trucks.

Babcock to Build—The Babcock Automobile Spring Co., 187 Oneida street, Milwaukee. Wis., will erect a brick factory in Milwaukee for production of spring assemblies for automobiles and trucks and also a number of shock-absorbing devices. The factory will be 30 by 100 feet and will be located on Milwaukee street, near Chicago avenue.

Canadian Studebaker Business Good—The Canadian business of the Studebaker Corp. has been increasing at such a rate during the past 3 months that the working force at the plant in Walkerville, Ont., has been increased by more than 200 men. Compared with the first 2 months of 1914 the increase of business has been about 25 per cent. thus far this year.

Trucks Made in Iowa Prison—Warden Sanders of the Iowa state prison at Fort Madison reports that plans are complete and that he now is ready to order materials for the motor trucks which will be built at the prison by the prisoners. He will make several trucks to exhibit to the Iowa legislature so provision can be made to make the motor-truck industry a permanent feature of the work at the prison if the work proves satisfactory. If the plant is established an appropriation must be made.

Prentiss - Wabers Leases Plant—The Prentiss-Wabers Mfg. Co., Grand Rapids, Wis., organized recently with $25,000 capital to manufacture gasoline and oil gauges, auxiliary chairs, motorists' cooking and luncheon sets, etc., has leased for 3 years the former Wipperman table factory at Grand Rapids and will start operations in the near future. The officers of the new corporation are: President, T. A. Taylor; vice-president, D. B. Philleo; secretary and general manager, G. N. Prentiss; general superintendent, H. H. Wabers. Mr. Prentiss is the designer and patentee of the line of articles to be manufactured and comes to Grand Rapids from Racine, Wis.

R. & L. Instrument Co. Formed—The R. & L. Instrument Co. has been organized at Beloit, Wis., to manufacture a unique signaling device for motorists. The device consists of illuminated disks attached to the front and rear of the car and containing two letters, R and L, meaning right and left. A push-button on the steering wheel operates the signal light and the driver is thereby able to indicate to vehicle and pedestrian traffic the direction in which he is about to turn. The new company is capitalized at $25,000 and the incorporators are the patentees, H. D. Ball, Leonard S. Carr, James Keeley and J. C. Floyd. A factory will be equipped for the production of the device at once.

Haynes Adds New Machinery—Five car loads of new machinery have just been received by The Haynes Automobile Co., Kokomo, Ind. The factory is again running 24 hours a day. The crowned fenders which have heretofore been purchased from outside sources will now be made entirely within the Haynes factory, in conformity with the policy of the Haynes company of manufacturing the complete car. The new fender-making equipment consists of presses and rolls for forming the crown or convex surface. The most economical method of producing such fenders is that of rolling the fender proper and pressing the ends. The drop-forging department has also been increased in capacity.

Another New Ford Building—The opening of the new $325,000 Ford branch building in Toronto, Ont., last week added one more large unit to the chain buildings which the Ford Motor Co. of Canada, Ltd., is establishing in the Dominion. Another new building is now nearing completion for the London, Ont., branch, and in the early summer the Ford company will open a $300,000 addition to the main plant at Ford, Ont. The new Toronto building is five stories high and of fireproof construction, the materials being brick and reinforced concrete trimmed with mat glazed terra cotta. The total area of floor space is 132,800 square feet. Part of the building is also devoted to the assembling of new cars manufactured at the factory in Ford, Ont.

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The Automobile Calendar

Mar. 6-13	Boston, Mass., Show, Mechanics Bldg., Boston Auto Dealers Assn., Boston Commercial Motor Veh. Assn.
Mar. 6-13	Savannah, Ga., Show, De Soto Hotel.
Mar. 6-13	New York City, Made in the U. S. A. Exhibition, Grand Central Palace.
Mar. 8-13	Indianapolis, Ind., Annual Spring Opening, Indianapolis Auto Trade Assn.
Mar. 8-13	Des Moines, Ia., Show, C. G. Van Vliet.
Mar. 8-13	Utica, N. Y., Utica Automobile Trade Assn.
Mar. 13-20	Harrisburg, Pa., Show Arena, Harrisburg Dealers' Assn.
Mar. 14	San Francisco, Cal., Panama - Pacific Cup Race. Panama - Pacific Exposition Grounds; Promoter, Panama - Pacific Exposition Co.
Mar. 17	Venice, Cal., Cal. Grand Prix, 300-Mile Road Race.
Mar. 17-20	Elgin, Ill., Show, W. H. Tidmarsh, Mgr.
Mar. 22-27	Bangor, Me., Show, Bangor Auditorium.
Mar. 22-27	Newark, O., Show, Arcade Bldg.
Mar. 24-27	Oil City, Pa., Show, New Armory.
Mar. 25-27	Mason City, Ia., Show, New Armory.
Mar. 30-April 2	Johnstown, Pa., Show, The Auditorium.
April	Calumet, Mich., Show, Coliseum.
April 3	Paterson, N. J., Show, Auditorium, R. A. Mitchell.
April 5-10	DuBois, Pa., Show, Moose Hall.
April 16	Manchester, Eng., Show, Ice Palace, North of England Motor Shows, Ltd.
April 20-22	Oklahoma City, Okla., Road Race, S. W. Auto Racing Assn.
May 17-18	Boston, Mass., A. A. A. Annual Meeting.
May 29	Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.
June 9	Galesburg, Ill., 200-Mile Race, Galesburg District Fair Assn.
June 19	Chicago, Ill., 500 - Mile Race, Chicago Speedway.
July 3	Sioux City, Ia., 300-Mile Race, Sioux City Speedway Assn.
July 4-5	Tacoma, Wash., Road Race.
July 5	Omaha, Neb., Speedway Races, Omaha Motor Speedway.
Aug.	Milwaukee, Wis., Independent Petroleum Marketers' Assn. of the U. S.; 1915 Convention in Milwaukee.
Aug. 2-3	San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.
Aug. 20-21	Elgin, Ill., Road Race.
Sept. 20-25	San Francisco, Cal., International Engineering Congress.

The Week in the Industry

Motor Men in New Roles

DOOLITTLE Zenith Advertising Mgr.—A. H. Doolittle has sold the A. H. Doolittle Advertising Service to the Louis A. Pratt Advertising Co., 401 Ford Bldg., Detroit, Mich., and is now sales and advertising manager of the Zenith Carbureter Co., whose advertising campaign he has handled for some time. Mr. Doolittle was formerly advertising manager of the Knox Motor Car Co., and of the Continental Motor Mfg. Co.

Bland Resigns—Harry Bland has resigned as president and secretary of the Blue Ribbon Garage, Springfield, Mass.

Pore Ford Sales Manager—O. E. Pore is sales manager of the Roberts-Toledo Auto Co., Ford dealer in Toledo, O. Mr. Pore succeeds H. W. Lancashire.

Hamilton Locomobile Exchange Car Mgr.—The Locomobile Co. of America has appointed H. S. Hamilton, manager of the exchange car department of the New York City branch.

Kenney King Factory Manager—W. C. Kenney has been promoted factory manager of the King Motor Car Co., Detroit, Mich., in place of T. A. Bollinger, who has resigned to go into business for himself.

Michigan Crown Offices Moved—The offices of the Michigan Crown Fender Co., Ypsilanti, Mich., have been moved to Detroit, Mich., where the headquarters are in the Kerr building, East Fort street.

Townsend Reo Sales Mgr.—W. F. Townsend has been appointed sales manager of the E. C. Johnson Motor Co., Broad and Spring Garden streets, Eastern distributors of the Reo, in Philadelphia, Pa.

Gaidzik Jeffery Foreign Representative—G. W. Gaidzik has joined the Thomas B. Jeffery Co., Kenosha, Wis., as a special foreign representative. He will represent the Jeffery Quad in Chile, having left for Iquique on February 27.

Heising Moon Purchasing Agent—G. F. Heising, recently appointed chief engineer of the Moon Motor Car Co., St. Louis, Mo., succeeding L. F. Goodspeed, is now head executive over the engineering and purchasing departments of that company.

Palmer Heads Pontiac Chassis—The Pontiac Chassis Co., Pontiac, Mich., has been organized with a capital stock of $100,000 to make automobile chassis. R. A. Palmer, until recently president of the Consolidated Car Co., is at the head of the new concern.

Berau Philadelphia Briscoe Manager—H. G. Berau, formerly Eastern supervising manager of the old Maxwell-Briscoe Motor Co., has been appointed manager of the retail department of the Briscoe Motor Distributing Co., 2033 Market street, Philadelphia, Pa.

Holihan Joins McCord—J. A. Holihan, formerly of the Briscoe Mfg. Co., and the Holihan Mfg. Co., Detroit, has joined the staff of the McCord Mfg. Co., Detroit. The Holihan Mfg. Co. has appointed William Christian as general manager in place of Mr. Holihan.

Mellish with Harrolds Co.—J. A. Mellish, for several years manager of the exchange car department of the Locomobile Co. of America, has resigned his position with that company and joined the sales force of the Harrolds Motor Car Co., distributor for Pierce-Arrow automobiles.

De Sautels Heads Detroit Office — An office will be opened in Detroit, Mich., by the Hammond Steel & Forging Co., Syracuse, N. Y. De Sautels, until recently with the Anderson Drop Forge Co., has been appointed western representative of the company in charge of the Detroit office.

Martindale Establishes Plant — F. N. Martindale, Indianapolis, Ind., has established a factory at Franklin, Ind., for the manufacture of the ultimotor, which he recently perfected. The ultimotor is a motor which may be attached to any horse-drawn vehicle, thus converting it into a motor vehicle.

Rogers Joins Marmon—A. J. Rogers has joined the forces of Nordyke & Marmon Co., Indianapolis, Ind., as head of the sales-service department and will give sales and advertising co-operation to Marmon dealers. Mr. Rogers was formerly manager of the Remy Electric Co.'s New York City office and later with the Jones Electric Starter Co. in Chicago.

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Garage and Dealers' Field

Mahan Has S-P Vaporizer—George H. Mahan, for a long time in the motor oil field in New England, has taken the agency for the S-P vaporizer with headquarters at 32 Oliver street, Boston, Mass.

Fisk Agency in Duluth—An agency will be opened in Duluth, Minn., by the Fisk Rubber Co., and Fred W. Neumann, who has been manager of the Duluth Auto Supply Co., during the last four years, will be in charge.

Seattle Pullman Moves—The Parker Motor Car Co., distributor of the Pullman car throughout the Northwest, has leased a new home at 1507-9-11 Broadway, Seattle. Agencies throughout the territory are being established.

O. K. Tire on Market—The O. K. Tire Co., with salesrooms in San Francisco, Cal., and a factory at Oakland, Cal., is now building automobile tires. M. F. Oliver is the manufacturer and Austin Kangee the sales manager of the new concern.

Pennsylvania Rubber Moves in Detroit—The Detroit, Mich., branch of the Pennsylvania Rubber Co., now located at 254 Jefferson avenue, will be moved to 864 Woodward avenue about April 1. This is the former home of the B. F. Goodrich Rubber Co.

Will Handle Sparton Advertising—The Sparks Withington Co., Jackson, Mich., manufacturer of the Sparton horn and other products, is about to enter upon an extensive advertising campaign. This advertising will be handled by the Taylor-Critchfield Clague Co., Chicago, Ill.

Firestone Makes Omaha Lease.—The Firestone Tire & Rubber Co. has leased a piece of ground 38 by 140 feet, at Farnam and Twenty-sixth streets, Omaha, Neb., and has contracted for a three-story and basement building to house its local salesrooms and offices.

Goodyear Factory Branch in Tacoma—Tacoma, Wash., is to have a direct factory branch for the distribution of Goodyear tires. Quarters have been secured at 774 Commerce street. C. B. Reynolds will be manager of the new house and J. H. McDiarmid, traveling representative.

Shipping Scripps-Booth Cars to Italy—The first shipment of Scripps-Booth cars was sent recently to Naples, Italy, to H. J. Holder, continental Europe factory representative. Mr. Holder will cover as many of the important European cities as possible in a Scripps-Booth car and will establish agencies en route.

Detroit Diamond Locates—Elmer W. Brown & Co., Detroit, Mich., recently organized to handle automobile supplies are now located at 967 Woodward avenue. The company has been appointed distributor for the Diamond tires. E. W. Brown is president; O. H. Dawson, vice-president and C. Rasmussen, secretary-treasurer.

Secure Osgood Deflector Agencies—H. B. Beattie & Co., 719 North Broad street, Philadelphia, Pa., and L. B. Wagner, 2917 Susquehanna avenue, Philadelphia, Pa., have secured the agency for Philadelphia and adjacent territory of the Osgood glass deflector, a one-piece patented glass prismatic lens.

Seattle Clearing House Opened—W. B. LaMay, for many years connected with the Anderson Electric Co. of Michigan, has located in Seattle, Wash., and opened an automobile clearing house at 1708 Broadway under the firm name of the Auto Clearing House, and its activities will be confined to buying and selling second-hand machines.

Columbus Maxwell Holds Banquet—The Maxwell Motor Sales Corp., through its Columbus, O., representative, the Everitt Auto Sales Co., tendered a banquet to about fifty sub-dealers in Ohio territory at the Virginia Hotel, Columbus, recently. L. F. Smith, district manager, who has been promoted to a position in New York territory, was one of the guests of honor. W. H. Lolley has been made the new district manager and he has opened headquarters in rooms 434-435 Columbus Savings & Trust Bldg.

Motor Car Mfg. Increases Population—Attributable mainly to the motor car business of the city, Kenosha, Wis., is now the seventh city of Wisconsin, having risen from ninth place in 1913 and thirteenth place in 1910. The present population is 29,062, as of July 1, 1914, according to the estimates of the federal census bureau. Milwaukee is credited with 419,054 population and Racine is now in second place with 44,528, having distanced Superior, for 15 years the second city, which now has 44,344 people. Racine as well as Kenosha, credit the motor car manufacturing business and allied industries for the gains.

Recent Incorporations in the Automobile Field

Arkansas

EUREKA SPRINGS—Auto Service & Supply Co.; $14,000; dealer. F. B. and B. M. Stowe, J. A. and E. E. Monagan.

California

SAN FRANCISCO—Spring Hub Automobile Wheel Co.; $200,000; manufacturer. W. T. Kearney, 681 Market street, San Francisco; E. Kreh, C. Westerman.

Connecticut

WATERBURY—Field & Feydt; $50,000; automobile manufacturer. R. C. Field, H. G. Feydt, both of Waterbury; A. H. Dayton, Naugatuck, Conn.

Delaware

WILMINGTON—Federal Motor & Mfg. Co.; $100,000; manufacture automobiles. R. B. Owen, B. Buehner, W. F. A. Buehner.

WILMINGTON—Flexible Traction Motor Truck Co.; $500,000; to build motor trucks. F. A. Conkling, Brooklyn; H. W. Brooks, W. J. Watson, New York City.

WILMINGTON—National Service Corp.; $100,000; manufacture and sell automobiles and allied appliances. C. J. Jacobs, C. H. Bishop, H. W. Davis.

WILMINGTON—Rapid Seal Distributing Co.; $100,000; manufacture of puncture healing liquids for tires. J. A. Vogel, H. R. Loose, G. W. Collins.

Georgia

ATLANTA—Atlanta Auto. Transit Co.; $10,000. J. F. Hazelton, Nelson Schippey, C. R. Linden.

AUGUSTA—Independent Motor Co.; $2,000. Henry Prontaut, W. R. Eve, A. B. Prontaut.

Idaho

AMERICAN FALLS—American Falls Auto Co.; $25,000; garage. Benjamin Adof, A. W. Davis, J. L. McKown.

Illinois

AURORA—Egermann Motor Sales Co.; $8,000; dealer. W. A. Egermann, S. L. Staley, W. O. Shippie.

BLOOMINGTON—Trott & Stubblefield Co.; $20,000; manufacturer of automobiles and motor trucks. E. C. Trott, L. W. Stubblefield, D. O. Hemenover.

CHAMPAIGN—Motor Sales Co.; $1,000; garage and dealer. R. S. Bassett, E. B. Bassett, Elmer Dillon.

CHICAGO—Berlin Motor Co.; $2,500; manufacturer and dealer in machinery, tools and automobile parts. T. W. Prindeville, A. J. Schmidt, J. D. Daly, 30 North LaSalle street.

CHICAGO—Davis Electric Equipment Co.; $2,500. E. S. Davis, J. E. Waters, I. G. Wooden.

CHICAGO—Federal Motor Truck Co.; $10,000; manufacturer and servicing of motor trucks. M. L. Puhinor, E. R. Lightcap, J. F. Brown.

CHICAGO—Johnson Variable Speed Gear Co.; $25,000; manufacturer automobile equipment and specialties. C. E. Sullivan, C. A. Johnson, O. C. Olesen.

CHICAGO—Rex Portable Garage Co.; $300; general manufacturing and construction. F. E. Warner, Clyde Stewart, J. R. Guthrie.

LA SALLE—Central Garage of La Salle; $50,000; L. B. Stever, L. Klee, E. S. Schurr.

PEORIA—Peoria Tractor Co.; $60,000; manufacture tractor engines. G. McFarland, C. F. Loomis, E. M. Smith.

Indiana

CONNERSVILLE—Connersville Taxi Co.; taxi business. Grant George, H. W. Williams.

INDIANAPOLIS—Adjustable Auto-Shoe Co.; $10,000; manufacturer. W. A. Parr, L. O. Gillaspy, G. E. Parr.

INDIANAPOLIS—Auto-Matic Lighter Co.; $10,000; accessories manufacturer. C. E. Haviland, E. W. Infield, O. J. Bowlder.

INDIANAPOLIS—I. J. Cooper Rubber Co.; $20,000; tire dealer. I. J. Cooper, A. D. Stocker, H. H. Brenner.

INDIANAPOLIS—Cole Sales Co.; $10,000; dealer. J. F. Minthorne, H. C. Lathrop, A. P. Conklin.

INDIANAPOLIS—Gibson Automobile Co. changed to Gibson Co.

INDIANAPOLIS—Henricks Novelty Co. to Henricks Magneto & Electric Co.

Iowa

CEDAR RAPIDS—L-Ty-To Co.; $10,000; manufacturer tire trouble remedy.

Kentucky

FORT THOMAS—Highland Auto Garage Co., $10,000. C. W. Evans, F. B. Stegeman, R. S. Moore, H. L. Jeffrey.

LOUISVILLE—Banner Transportation Co.; $8,000. J. L. Marshall, J. D. Marshall, W. T. Lewis.

LEXINGTON—Jitney Service Co. of Ky.; $3,500. R. M. Cunningham, F. A. Jack, C. W. Koerner.

LOUISVILLE—Grant Mfg. Co.; $9,000; chemical manufacturer and automobile specialties. A. C. Grant, R. E. Simms, J. L. Lenihan.

Maine

KITTERY—Triplex Inner Tube Co.; $200,000; to manufacture and deal in inner tubes, tires, etc. H. Mitchell, H. A. Paul.

PORTLAND—Gillette Safety Tire Co.; $1,000,000; manufacturer. A. E. Jones, T. L. Croteau, A. B. Farnham, C. G. Trott, J. P. O'Donnell, J. R. Griffin.

Michigan

ADRIAN—Maple City Specialty Co.; $10,000; dealer in automobile accessories. B. E. Giles, R. Cushing.

DETROIT—American Motor Sales Co.; $6,000; dealer. J. C. Pennell, Hanley Dawson, E. E. Sullivan, B. C. Pennell.

DETROIT—Bell Pump & Mfg. Co.; $20,000; to manufacture automobile tire pumps. B. W. Bue, H. L. Morton, M. E. Oakley.

DETROIT—Dadco Auto Service Co.; $1,500. C. Waters, F. Connell, W. C. Furrington.

DETROIT—Detroit Tapering Radiator Co.; $25,000; manufacturer. J. A. and M. S. Moross, B. C. and R. C. Loring.

DETROIT—Magee Sheet Metal Machinery; $20,000. W. R. and D. R. Magee, F. W. Atkinson.

DETROIT—Pilgrim Motor Co.; $200,000; manufacturer automobiles. C. H. Lute, W. H. Radford, L. C. Welford.

DETROIT—F. H. Primeau Co.; $10,000; garage. F. H., J. B. and J. B. Primeau, Jr.

DETROIT—Schneider Electric Co.; $5,000. G. Schneider, L. Fetes, Jr., A. L. Cook.

DETROIT—Scripps Motor Co.; $250,000; manufacturer. R. V. Warman, A. J. Downey, T. F. W. Meyer, W. E. Scripps.

DETROIT—Wolverine Bus Co.; $6,000; jitney bus line. M. M. Wolff, Eli Cohen, Florence Wolff.

DETROIT—Wolvorine Winter Top Co.; $2,000; manufacturer. J. E. Murphy, H. H. Creamer, G. F. Monahan.

FLINT—Dort Motor Car Co.; $500,000; manufacturer. F. A. Aldrich and others.

GAGETOWN—Meyers Hoffman Co.; $50,000; to manufacture contrivance invented by C. E. Meyers, 73 Rosedale court, which is claimed to be puncture proof.

GRAND RAPIDS—Grand Rapids Saxon Co.; $5,000; dealer.

JACKSON—Frost Gear & Forge Co.; $300,000 to $400,000.

LANSING—American Double Service Tire Co.; $3,000; dealer. Hanley Dawson, J. G. Pennell, B. C. Pennell.

Minnesota

MINNEAPOLIS—Shotwell-Harris Co. changed to Shotwell-Hobart-Johnson Co.

Mississippi

JACKSON—Jackson Jitney Car Co.; $2,000. A. C. Smith, L. C. Reuning, S. J. Myars, W. G. Johnson.

Missouri

CHILLICOTHE—Adams Automobile & Supply Co.; $25,000; dealer. C. F. Adams, R. F. Adams, C. A. Adams, T. J. Grothe, A. J. Cole.

KANSAS CITY—Kansas City Motor Bus & Transportation Co.; $2,000. E. C. Belg, J. A. Daniels, S. P. Daniels.

KANSAS CITY—Packard Auto Co.; $5,000; dealer. J. H. White, J. A. Kelly, J. R. Neale.

KANSAS CITY—Summers Motor Devices Co.; $5,000. W. E. Robbins, C. E. Summers, C. E. Adams.

ST. LOUIS—Detroit Electric Car Co. of Mo.; $2,000; dealer. M. B. Strauss, C. D. Long, C. M. Rice.

North Dakota

FARGO—Red River Automobile Supply Co.; $25,000; to job automobile supplies. J. O. Dahl, H. E. Day, R. E. Robinson.

New Jersey

BAYONNE—Air Spring Tire Co.; $250,000; manufacturer. J. D. Milne, W. E. Meyer, E. H. Hints, W. G. Smith, Jersey City.

CAMDEN—Johnson Rose Auto Co.; $10,000; dealer. Neff Johnson, F. A. Rose, James Kershaw, B. F. Savage, F. G. Homan.

EAST ORANGE—Chevrolet Motor Co. of New York; $300,000; dealer. W. C. Durant, W. W. Murphy.

EAST ORANGE—Motor Sales Agency of the Oranges; $25,000; dealer. H. F. Herdman, A. F. Herdman, A. T. Muir.

EDGEWATER PARK—Edge Auto Devices Co.; $25,000; accessory manufacturer. M. B. Earl, B. W. Earl, F. H. Munch.

NEWARK—Automobile Tire Cooler Co.; $500,000; manufacturer. D. Hall, A. Lindsley, C. C. Leonard.

NEWARK—Estes Airless Tire Co.; $50,000; manufacturer. M. F. Amonett, B. F. C. Rothwell, M. J. C. Walter, Newark.

NEWARK—Gibraltar Tire and Tube Co.; $100,000; manufacturer. H. L. Brown, R. Bradshaw, R. Brown.

NEWARK—Self-Raising Seat Appliance Co.; $100,000; manufacturer automobile, mechanical, electrical, etc., stools, devices and appliances. S. M. Eisner, L. Lasser, O. W. Jackson.

PATERSON—W. H. Richardson Co.; $50,000; to manufacture motor vehicles. W. H. Richardson, C. H. Richardson, B. J. Burke.

PLYMOUTH—International Wire Tire Co.; $1,000,000; manufacturer. J. S. Lyons, G. T. Brown, T. A. Zukoski, Plymouth.

TRENTON—Auto Salvage & Sales Corp.; $50,000; dealer. R. O. Foust, H. P. Clymer, T. C. Mappe.

TRENTON—Globe Rubber Tire Mfg. Co.; $650,000; to manufacture tires. W. H. Linburg, J. S. Broughton, H. L. Joyce.

TRENTON—Three Star Tire Co.; $50,000; manufacturer. E. H. Steel, A. F. Updike, R. G. Whitehead.

TRENTON—West End Garage & Machine Co.; $25,000. E. G. Hancock, C. E. Hancock, W. T. Johnston.

New York

ALBANY—Consalus Tire Co.; $15,000; dealer. V. E. Consalus, M. A. Consalus, 432 Clinton ave., E. W. Sanford.

ALBANY—Gordon Motor Truck Co.; $3,000. J. H. Gordon, C. F. Gordon, G. M. Gordon, all of 12 Second street.

BAY SHORE—Bay Shore Motor Sales Co.; $5,000; dealer. C. M. Hart, C. F. Hart, A. B. Capron, Bay Shore.

BRIGHTON HEIGHTS—New York City; Brighton Heights Garage of Staten Island; $2,000. C. A. Furlong, Annie Furlong, H. J. Furlong, 214 Highland Boulevard, Brooklyn.

BRONX—Champion Electric Mfg. Co.; $50,000; electrical devices for automobiles. Mauro Lamparelli, 2312 Hughes avenue, Bronx; Salvatore Scognamillo and Frank Scognamillo.

BROOKLYN—Auto Towing & Supply Co.; $1,500; to rent cars for towing purposes and to conduct garage. G. H. Seeth, W. F. Seeth, C. E. Hiscox, 1121 Bedford avenue, Brooklyn.

BROOKLYN—Bay Ridge Rubber Corp.; $6,000; manufacturer inner tires. M. Seltzer, 213 1st ave., N. Y. City; M. DeWaltherriff, Florence Wimple.

BROOKLYN—Dean Garage; $1,000. F. L. Johanns, P. J. Howard, C. E. Fiske, 20 Fort Greene Place.

BROOKLYN—Dunham & Black; $15,000; dealer. J. G. Stockton, 458 Prospect Pl., Brooklyn; F. G. Dunham, Allan Black.

BROOKLYN—Eveready Tire & Rubber Co.; $40,000; tire manufacturer. W. J. Woodcock, F. W. Woodcock, 102 Gates avenue, Brooklyn; A. W. Norwalk.

BROOKLYN—Hancock Garage and Repair Co.; $6,000. J. P. Murray, Fred Hofmann, A. Brauner, 1314 Stebbins av., Bronx.

BROOKLYN—Hart Waterproof Mfg. Co.; $15,000; manufacturer waterproof automobile slip covers. J. H. Hart, J. F. Hart, 960 Jamaica avenue, Brooklyn; E. E. Berry.

BROOKLYN—Incas Automobile Co.; $5,000; dealer. J. H. Eckhoff, Jr., 835 Union street, Brooklyn; Malcolm McPhail.

BROOKLYN—Norman Tire Repair & Supply Co.; $2,000; dealer. P. Hind, W. Hind, 685 Manhattan avenue, Brooklyn; W. H. Preston.

BROOKLYN—Nonpareil Garage, Inc.; $5,000. J. E. Kerr, Henry Redelsheimer, Samuel Goldberg.

BROOKLYN—S. & K. Oil & Gasoline Co.; $5,000. N. H. Kramer, S. Schenkel, L. J. Kaufman, 591 Bedford avenue.

BROOKLYN—Stuyvesant Heights Motor Car Service; $1,000. V. Fogler, J. Fogler, 73 Stuyvesant; J. F. Brozek.

BROOKLYN—Uno Garage Co.; $1,000. H. D. Bristol, F. W. Shaw, both of Oceanside, N. Y.; Carlo Rossa.

BROOKLYN—Williams Taxicab Co.; $1,200. G. D. Williams, J. F. Disken, Felix Braguglia, 1404 59th street, Brooklyn.

BROOKLYN—Williams & Tschanz Auto Co.; $1,000. E. Tschanz, A. Tschanz, 640 Prospect Pl.; E. Williams.

BROOKLYN—I. Zagon & Co.; $2,000; dealer. I. Zagon, R. Zagon, 104 Bay 25th street, Brooklyn; Jacob Glaessir.

BUFFALO—Buffalo Automobile Spring Co.; $10,000 to $25,000.

BUFFALO—Iroquois Garage; $2,500. E. D. Emerson, C. C. Page, F. J. Handel.

BUFFALO—Kay-See Motor Service Corp.; $15,000; dealer. H. B. Parry, A. E. Bargar, E. L. Marshall.

BUFFALO—Motor Express & Sales Corp.; $600,000; general cartage, transfer and express business. J. G. Berner, J. T. Mooney, Buffalo.

BUFFALO—Simcott Motor Sales Co.; $10,000; dealer. D. E. Knowlton, R. A. Kellogg, P. A. Sullivan, 535 Ellicott sq.

CENTER MORICHES—Center Moriches Garage; $5,000. J. S. Robert, J. S. Penney, Clarence C. Ross.

EDDYVILLE—Almirall & Co.; $200,000; manufacturing automobile fire extinguishers. J. A. Almirall, W. C. Adams, W. J. Wood, 1 Dominick street, New York City.

HOPEWELL JUNCTION—Clove Branch Shop; $5,000; garage. W. A. Martin, Frank Schier, L. M. Woodruff, 460 West 143d street, New York City.

MAYVILLE—Mayville Hardware & Garage Co.; $25,000. A. H. Brace, Harry Arnold, S. E. Swetland.

MIDDLETOWN.—Lion Sales Co., $5,000; dealer. R. F. Finch, C. M. Breiner, E. A. Heffernan.

NEW YORK CITY—Advance, Alert Auto Co.; $3,000. G. Reif, 108 W. 43d street; E. M. Lichter, M. A. Murray.

NEW YORK CITY—Diamond Carburetor Co.; $100, dealer. J. M. Baum, C. M. Rosenthal, Max Horowitz, all of 35 Nassau street.

NEW YORK CITY—Auto Trunk and Acme Suit Case Mfg. Co.; $10,000. Julius Schwartz, 1010 Eastern Parkway, Brooklyn; B. Ammerman, A. Zieve.

NEW YORK CITY—Broadway Auto Body Co.; $5,000; dealer. K. Dorjath, J. Licz, E. Grebert, 1926 Broadway.

NEW YORK CITY—Dals Auto Supply & Accessory Co.; $25,000; manufacturer motors, appliances, etc. B. Schane, A. L. Schane, D. L. Schane.

NEW YORK CITY—Diamond Carbureter Co.; $100,000; manufacturer. E. C. Cox, 508 W. 135th street; G. B. Read, August Spindler.

NEW YORK CITY—Economical Garage; $10,000. P. J. Holdsworth, 252 W. 69th street; H. B. Miller, C. A. Miller.

NEW YORK CITY—Economical Tire & Supply Co.; $10,000; dealer. G. Rauchfuss, 1904 Broadway; T. F. MacMahon, A. T. Heimburg.

NEW YORK CITY—Flaum Shock Absorber Corp.; $20,000; manufacturer. S. M. Halper, Julius Flaum, 175 Hudson street; J. E. Duross.

Automobile Agencies Recently Established

PASSENGER CARS

Ohio

Dayton	Ford	Dayton & Troy Automobile Co.
Delaware	Regal	Griffith & Cone
Delaware	Oldsmobile	L. H. Carpenter
Delphos	Oldsmobile	Mox Motor Co.
Dennison	Haynes	City Auto Co.
E. Palestine	Oldsmobile	M. E. Newbauer
Elyria	Haynes	Elyria Garage Co.
Findlay	Haynes	Castle's Garage
Fremont	Overland	Palace Garage
Greenville	Haynes	W. E. Brown
Greencamp	Regal	R. C. McClellan
Grove City	Regal	E. Emmelheinze
Hillsboro	Maxwell	Hillsboro Motor Car Co.
Jeffersonville	Regal	Guy Carr
Lake	Oldsmobile	Windermere-Euclid Garage Co.
Leipsig	Westcott	Dallas Kirk
Lima	Lewis	Shappell Bros.
Logan	Haynes	J. S. Case
London	Regal	A. O. Hicks
Lynchburg	Regal	A. R. Pratt
Marion	Regal	U. G. Lawrence & Son
Massillon	Haynes	The Motor Car Sales Co.
Massillon	Oldsmobile	The Miller Garage
Newark	Regal	J. E. Owens
Seville	Haynes	I. M. Overholt
Sidney	Regal	B. D. Heck
Springfield	Regal	B. H. Brunton
Toledo	Argo	H. Francke
Toledo	Kissel	Bunnell Auto Sales Co.
Toledo	King	Litchie Auto Co.
Toledo	Franklin	Standard Garage
Toledo	King	Litchie Auto Co.
Wapakoneta	Overland	J. W. Ellicott
West Jefferson	Regal	W. H. Pence
Williamsport	Haynes	J. Schleick
Xenia	Buick	M. H. Schmidt

Oklahoma

Bartlesville	Moon	R. G. Uhl
Bartlesville	Moon	R. G. Uhl & Son
Cordell	Krit	C. H. Murdock
Cordell	Saxon	C. H. Murdock
Oklahoma City	King Eight	Stapleton Motor Sales Co.
Oklahoma City	Oldsmobile	Acme Motor Car Co.
Oklahoma City	Saxon	Fremont Motor Co.
Tulsa	Haynes	Okla-Haynes Auto Co.
Tulsa	Dodge Bros.	E. Westerman

Oregon

Portland	Chandler	Dulmage Manley Auto Co.

Pennsylvania

Beaver Falls	Herff-Brooks.	G. S. Hunter
Chambersburg	Chandler	J. Caufman
Clearfield	Haynes	Wallace Garage
Curtisville	Kissel	N. M. Snyder
Hazelton	Haynes	Adam Aidam
Hazelton	Kegal	Spruce St. Garage
Horsham	Westcott	T. W. Tyson
Latrobe	Oldsmobile	Rose & Steele
Mt. Union	Herff-Brooks.	F. H. Culver
Philadelphia	Maxwell	Sterling Motor Car Co.
Philadelphia	Briscoe	The Gibson Auto Wks.
Philadelphia	Briscoe	Ideal Motor Car Co.
Pottsville	Haynes	Joseph Davenport
Saltsburg	Oldsmobile	J. W. Woodend
Scranton	Regal	Conrad Bros.
Tamaqua	Haynes	Tamaqua Auto Garage & Repair Co.

South Dakota

Aberdeen	Haynes	T. E. Payne
Deadwood	Oldsmobile	G. Kilker Garage & S. House
Emery	Haynes	J. P. Reighling
Hudson	Haynes	S. F. Hoffman

Tennessee

Knoxville	Franklin	Kuhlman Motor Sales Co.
Nashville	Cadillac	Cadillac Sales Co. of Nashville

Texas

Corsicana	Saxon	L. H. Lee
Dallas	Saxon	Saxon Sales Co.
El Paso	Chandler	Lone Star Motor Co.
Lockhart	Moon	E. H. Lipscomb

Utah

Logan	Dodge Bros.	Blair Motor Co.
Logan	Ford	Kimball Auto Co.
Logan	Buick	Blair Motor Co.
Ogden	Cadillac	Cadillac Sales & Service Co.
Richmond	Oldsmobile	Bair Auto Co.
St. George	Oldsmobile	E. H. Snow
Salt Lake City	Metz	A. A. Sims

Vermont

Brandon	Herff-Brooks.	F. R. Barker

Virginia

Chilhowie	Oldsmobile	J. L. Vance & Co.
Eastville	Oldsmobile	Eastville Auto Co.
Staunton	Oldsmobile	J. H. Schultz

Washington

Cottonwood	Overland	O. D. Simmons
Fairbanks, Alaska	Hudson	Roy Rutherford
Lynden	Maxwell	A. A. Bausman
Malden	Maxwell	L. F. Rohleder
Rosalie	Overland	Snyder & Fullerwood
Seattle	Pilot	Barager & Stratton
Seattle	Hudson	Northwest Motor Co.
Seattle	Oakland	Mack & Fornsworth
Spokane	Reo	E. R. Fosdick
Steptoe	Maxwell	T. A. Bennett
Tacoma	Dodge Bros.	Griffith Motor Co.
Tacoma	Studebaker	Cadillac Auto & S. Co.
Thornton	Hudson	G. F. Hodgson
Thornton	Maxwell	T. A. Bennett
Walla Walla	Buick	T. S. Steele & Co.
Wilbur	Paige	T. F. Miller

West Virginia

Wheeling	Dodge Bros.	H. S. Sands Elec. & Mfg. Co.
Marlinton	Haynes	C. H. Copenhaver

Wisconsin

Belgium	Maxwell	Hubing & Husting
Belgium	Ford	Hubing & Husting
Black River Falls	Overland	T. Tollac
Black River Falls	Ford	O. C. Flugstad
Cedarburg	Dodge Bros.	Roebken Bros.
Chippewa Falls	Dodge Bros.	M. Cameron
Clinton	Buick	Terwilliger & Son
Clinton	Dodge Bros.	Terwilliger & McCommons
Columbus	Ford	Schunk & Procter
Crandon	Ford	S. Raymond
Delavan	Overland	C. H. Burns
Delavan	Ford	C. H. Burns
Delavan	Ford	C. J. Quinn
Eau Claire	Haynes	Johnson Mch. Works
Eau Claire	Oldsmobile	Darwin Motor Car Co.
Gillett	Buick	C. F. Kitzinger
Hancock	Overland	Jones & Pierce
Hillsboro	Oldsmobile	Picha Brothers
Iola	Overland	Swenson & Rosholt Garage
Iola	Ford	Swenson & Rosholt Garage
Iola	Case	Swenson & Rosholt Garage
La Crosse	Paige	J. Nieetz
Lake Mills	Studebaker	F. M. Seaver
Madison	Overland	Park Motor Co.
Madison	Cole	Park Motor Co.
Milwaukee	Velie	Wait Auto. Co.
Milwaukee	Moline	Wait Auto. Co.
Milwaukee	Detroiter	Milwaukee Motor Sales Co.
Milwaukee	Moon	Durbin-Thomson Co., Ltd.
Milwaukee	Abbott	Intersection Garage Co.
Milwaukee	Chevrolet	Wells Garage Co.
Milwaukee	Monroe	Wells Garage Co.
New Richmond	Ford	B. & W. Garage
Pella	Haynes	F. A. Crosskoph
Prairie du Sac	Dodge Bros.	Lloyd Tarnutzer
Rhinelander	Ford	Oneida Garage Co.
Rhinelander	Partin-Palmer	Roland Scheibe
Sheboygan	Cole	H. Struebing Garage
Sheboygan	Ford	Gillette Motor Co.
Sheboygan	Sphinx	H. Struebing Garage
Sparta	Oldsmobile	E. D. Brown
Spring Green	Glide	L. F. Wells
Sun Prairie	Dodge	E. E. Beers & Co.
Tomah	Oldsmobile	L. G. Guenther
Two Rivers	Dodge Bros.	O. Winkelmiller
Wautoma	Overland	A. Cutts
Westby	Oldsmobile	Hanson & Nustad
Whitehall	Oldsmobile	Auto Sales Co.

Wyoming

Rock Springs	Oldsmobile	West Central Auto Co.

COMMERCIAL VEHICLES

Alabama

Birmingham	Denby	T. E. Morris, Jr.

California

Los Angeles	Republic	Mack Motor Truck Co.

Connecticut

New Haven	Denby	J. McLay

Florida

Miami	Denby	L. A. Jones Garage

Georgia

Augusta	Koehler	Speth Garage & Sales Co
Atlanta	Signal	Signal Truck Co.
Macon	Koehler	W. E. Cookerly
Savannah	Koehler	J. C. Lamb Auto Repair Co.

Illinois

Bloomington	Koehler	C. U. Williams Son & Co
Chicago	Signal	Siegmund-Baylies Truck Co.

Iowa

Greenfield	Koehler	Coffey & Irwin

Kentucky

Franklin	Koehler	Franklin Hdw. Co.
Lebanon	Koehler	Lewis & Drye
Louisville	Denby	Yager Motor Car Co.

Maryland

Baltimore	Koehler	L. M. Vordemberge

Massachusetts

Beverly	Denby	E. F. Sullivan
Boston	Denby	Denby Motor Truck Sales
Boston	Koehler	Adalian Brothers
Falmouth	Koehler	Crocker Garage
N. Cambridge	Signal	Henderson Bros.
Southbridge	Koehler	Weld & Beck

Michigan

Detroit	Denby	Transportation Eng'r Co.

Missouri

St. Louis	Signal	Best Service Truck Co.

Nebraska

South Omaha	Koehler	Holmes Adkin Co.

New Jersey

Newton	Koehler	Wm. Iliff
Paterson	Koehler	G. & A. Bell

New York

Auburn	Denby	Ross Automobile Co.
Buffalo	Denby	F. A. Lobee & Son
Hamburg	Denby	D. W. Broadbeck
New York	Denby	Markt & Hammacher
New York	Denby	Thomson & Co.
New York	Denby	Walter Stevens & Co.
New York	Denby	Denby Motor Truck Sales Co.
Rochester	Denby	J. Cunningham
Syracuse	Denby	Syracuse-Buick Sales Co

North Carolina

Greensboro	Koehler	Greensboro Motor Car Co.

Ohio

Chillicothe	Koehler	B. Mallow
Cincinnati	Denby	Frank Bauer

Pennsylvania

Erie	Denby	A. H. Murphy
Greencastle	Koehler	Lininger's Garage
Kane	Denby	Hudson-Bender Motor Car Co.
Meadville	Koehler	W. L. Krider
Pittsburgh	Denby	Andrew Bonson Co.
Pittsburgh	Signal	Stewart Motor Truck Co.
Reading	Koehler	S. A. Stein

Virginia

Norfolk	Koehler	City Garage
Richmond	Koehler	Alsop Motor Co.

Washington

Spokane	Signal	Signal Truck Co.

Factory Miscellany — Continued

Cleveland Plant Sold—The plant formerly occupied by the Samuel Austen & Sons Co., at Broadway and Gallup streets, Cleveland, O., has been sold to the H. Wagner Rubber Co., which will manufacture all kinds of rubber products.

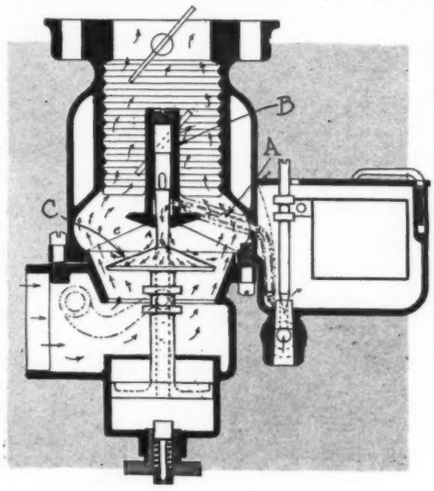
Billings & Spencer Altering Plant—Extensive alterations are now in progress at the plant formerly occupied by the Columbia Motor Car Co., Hartford, Conn., and recently purchased by the Billings & Spencer Co. The forge shop has been entirely remodeled; in fact the whole plant has been subjected to a complete change. The Billings & Spencer Co. is said to be rushed just now with large orders for drop hammers.

Standard Aluminum Adds Warehouse—The Standard Aluminum Co. of Two Rivers, Wis., at its annual meeting decided to increase the capital stock from $250,000 to $500,000 to accommodate the growth of the business. The Alexander warehouse opposite the plant, until now held under lease, has been purchased. The company is running at full capacity and on full time and may make extensions during the present year.

Findlay Co. to Build in Spring—The Electrical Motor and Construction Co., Findlay, O., has increased its capital stock from $15,000 to $30,000, and established branch houses at Fostoria and Norwalk. In the spring the company will build an immense addition to the plant in this city.

ACCESSORIES

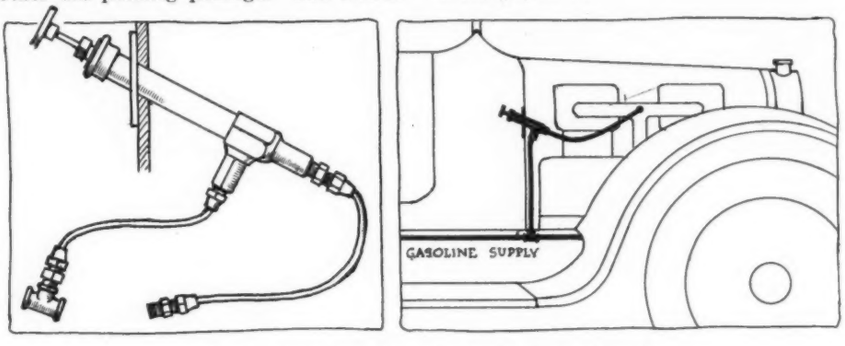
NEW Carbureter — A carbureter called the Economic is of the type wherein the size of both air and gasoline passages are controlled simultaneously, but the instrument is built with the principal parts in a position which is highly unusual. As reference to the illustration will show, the fuel



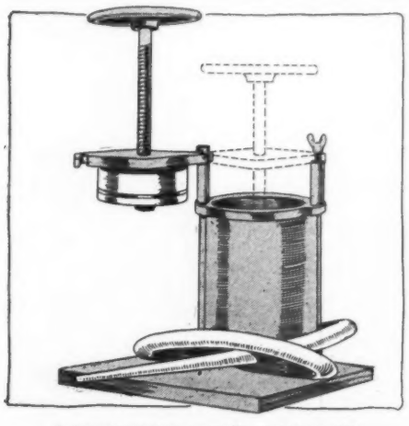
The Economic carbureter

passes downward into the mixing chamber instead of upward, and there is no venturi or choke tube. Fuel passes up the pipe A to the inside of the part B, which is fixed in position and acts as the upper guide for the combined air valve and fuel needle C. The metering part of the fuel needle is tapered so that the fuel flow increases as C is lifted by motor suction, and the gasoline falls upon the conical surface from the edge of which it is supposed to be picked up by the rising air stream. For starting adjustment the little plug seen at the bottom of the dashpot and the extreme bottom of the carbureter can be set up and down so as to leave the correct opening between the edge of the air valve cone and the wall of the carbureter body. For adjusting the working of the valve and fuel needle the lever shown in dotted line behind the carbureter is connected to the steering wheel or cowl board through the medium of a spring, but the weight of the floating portion has the greatest share of this control. To adjust the carbureter to suit different motors the correct floating member has to be chosen, this being done by the factory. It is claimed that the carbureter operates at very low suction, and it is certainly of a most simple design. It can be taken apart very quickly for cleaning and assembled again without danger of disturbing adjustments.—Wellington P. Kidder, Boston, Mass.

Self-Feeding Primer—A primer known as the Universal has as its special feature a lead which is placed in connection with the main gasoline tank so that it requires no special filling with gasoline in small quantities. On the cowl board or in any other convenient position a small hand pump is located, and this has two pipes, one being the suction lead and the other the priming passage. The former ends in a T-piece, which is inserted at a convenient point in the main gasoline line, and the latter is taken to the intake manifold.—Dodge Motor Vehicle Co., Cambridge, Mass.



The Universal Primer and method of attaching it



A large grease gun for garage use

Garage Grease Gun—A large gun to hold a gallon of grease and so substantially made that it should last almost forever is a new garage accessory. It is of solid cast-iron, and the sketch shows the way in which the top is removed for charging. The makers suggest that using so large a quantity of grease at one charge saves waste, and the gun registers the amount discharged at any one time, so that it is easy to know how much has been put into any particular car. To carry the grease to the required point a special rubber hose is employed, this material being chosen in preference to metallic flexible pipe because the latter is destroyed if kinked or run over by a car, while the rubber cannot be injured in this way. Two different nozzles are included and there is a cap to prevent leakage of grease when the gun is out of use.—John J. Zwald, Emporium, Pa.

Tops and Upholstery — Convertible tops for roadsters or touring cars are becoming increasingly popular, especially as they can be made to fit standard models of various makes of automobiles. Two styles of light weight and good appearance are described in a recent pamphlet, which also deals with one-man tops and a range of seat covers.—Springfield Harness Co., Springfield, Mass.

Portable Garages—These small buildings must be in great demand, if one may judge by the very large number to be seen in any town. The qualities to be desired in them are strength, simplicity of erection and ability to vary size. The Dixie garage is made up from angle iron and corrugated galvanized iron in sections 4 feet long, so it is capable of extension to suit the customer's requirements, and has a very substantial frame. There are a pair of stout double doors, and a second door can be supplied if desired.—C. C. Fouts Co., Middletown, O.

Oxygen Generator—The Oxyphor oxygen generator is a device intended to replace the cylinder of compressed gas used for almost every purpose to which oxygen is applicable. It is intended to appeal especially for use with cylinder-cleaning outfits. There is a metal case, which contains water, and a cartridge of Oxyphor, and the method of using is to punch a few holes in the cartridge and then place it in the container. Gas can be drawn off by a valve and the apparatus used again and again till the cartridge is exhausted. — Arthur Wood, Brooklyn, N. Y.

Tires—The special points in the construction of Cable-Structur tires are dealt with at length in a pamphlet issued by the manufacturers. A feature is made of the fact that the casings are made by hand labor, and hand labor paid by hour rate and not on the piece, so that time is given for careful workmanship. Special pains have been taken to strengthen the bead, which contains cables sufficient to supply all the strength, since a beadless rim is used. The tire fits any of the modern rims with reversible flanges. The whole fabric is built up from cables, and a free use of rubber binds the whole structure together. — Mansfield Tire & Rubber Co., Mansfield, O.

Master Vibrator—The Scudor master vibrator is a simple design of this type of ignition device and is sold at a remarkably low price. Attention is drawn to the large size of the magnet and the condenser, while the platinum points are of platinum-iridium alloy of good diameter and with a long range of adjustment. Special pains are taken with the condenser to reducing sparking at the contact points and it is claimed that the vibrator construction is such that it is impossible for the points to stick together.—Scudor Mfg. Co., Lowell, Mass.